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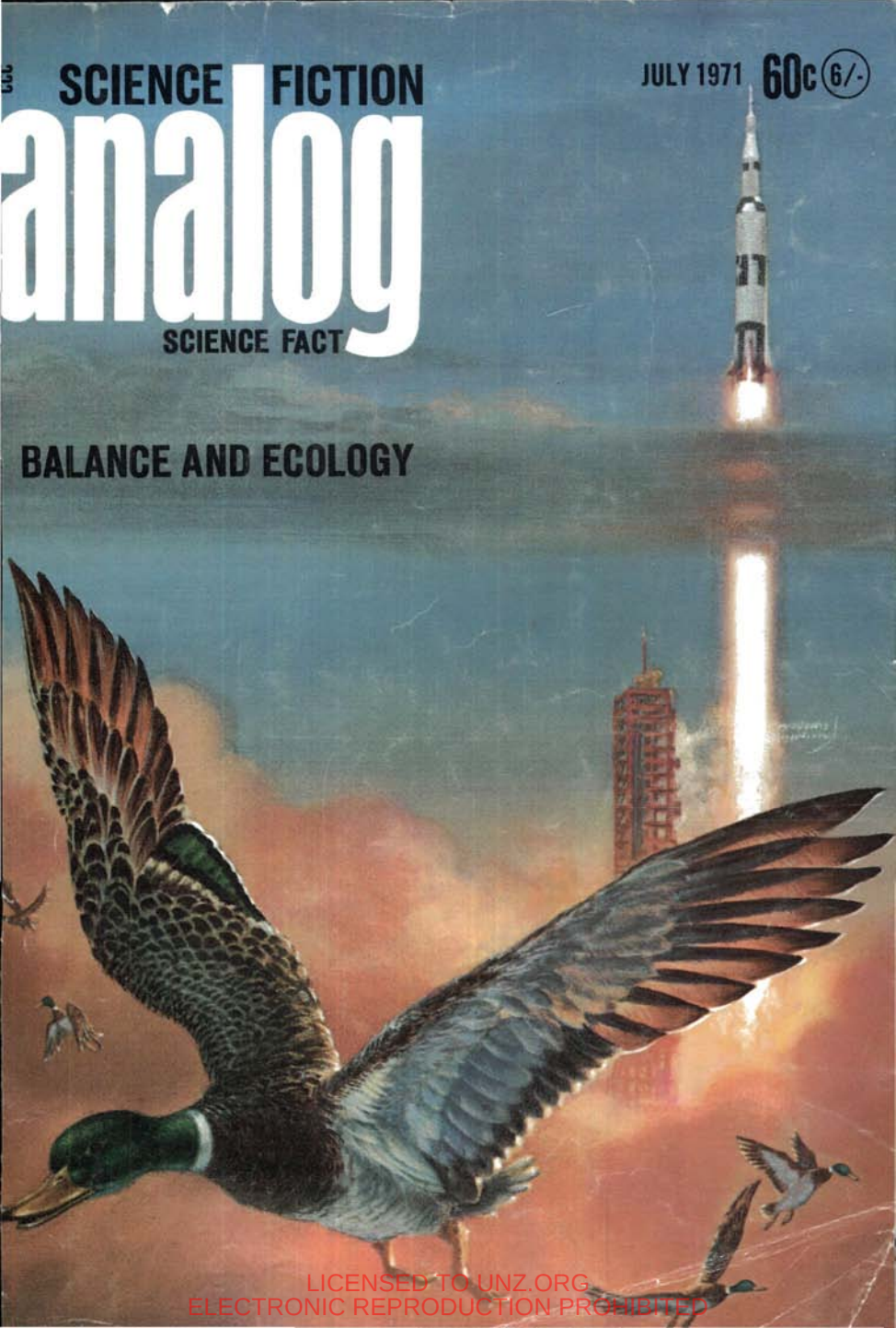
BALANCE AND ECOLOGY



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analog

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This magazine has been considering ecology for somewhat longer than the current explosive—and hysterical—interest in the subject. Perhaps because we've thought about it somewhat longer, and not just as a sudden latest-thing interest, not a Cause for This Season, we're a bit less terribly, terribly concerned—and somewhat less hysterical about it.

This month's cover by Kelly Freas was painted from photographs and sketches—and memories!—Kelly made while he was down at Cape Kennedy watching the Apollo 14 lift-off. (Coming up shortly is an article by Gordon R. Dickson, illustrated by Kelly's sketches.) The cover scene was one that strongly impressed Kelly while he was at the Cape—which (a factor most people don't realize!) is a National Wildlife Sanctuary. Most of you who've watched the launches on TV have seen birds flying across the picture—gulls, ducks, and assorted feathered friends of the really *big* Big Birds. But the Cape has all sorts of interesting wildlife—armadillos, nutria, as well as the familiar alligators, and even a jaguar or two.

The gulls, ducks, armadillos, alligators—and people—all seem to be able to live happily, to survive and raise their families—the wildlife preserve prospers—despite the launches of the birds ranging from little weather-sounding jobs right up the scale to Saturn Vs.

Now when a Saturn V takes off, your TV can do a good job of letting you *see* what happens. Actually, you can see more and in more detail, than you could if you were on the scene. If you were there, you wouldn't see the ignition and start of lift-off from a viewpoint on the launch tower itself; you'd be dead and already cremated if you tried it. And those in the Press Stand can't watch through the radar-guided telescope that follows the Apollo while it climbs 150 miles up and 250 miles down range, and lets you watch the staging.

But what you can't hope to sense via TV is the sound. The odd thing is that when you're there, you don't actually *hear* it in the normal sense; there's a little muscle in the ear that can slacken the tension on the eardrum in such a way as to render you temporarily deaf—it's an evolutionary device that protects the hearing apparatus from too-great overloads. And a Saturn V takeoff, even at

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three miles, is way, way, *way* beyond the overload point. Under the impact of that stupendous sound, the ear becomes almost totally deaf—you can't hear it.

But you feel it. You feel it thrumming on your abdomen, and resonating with your bones, and drumming on your skull—you feel it in every organ of your body. That's part of the reason the Press Stand is three miles from the launch; go much nearer, and the intensity of the sound waves will start homogenizing the cells of your body. This makes for an exciting, but brief, life.

The Press Stand is made of steel-reinforced concrete. When the Saturn V tunes up for takeoff, the whole massive stand starts resonating; you feel it bouncing against your feet.

The noise of an Apollo takeoff can't equal a Krakatoa explosion, and it doesn't reach as high a peak as a fifty megaton thermonuclear bomb—but the total sound-energy output is in the same league, because the Saturn's roar goes on and on and on . . .

Naturally, no TV could reproduce that sort of a bellow.

Now the point that interests me greatly is that all that howling, bellowing, shrieking scream of the multi-million horsepower engines, yowling their mightiest in dense sea-level air, is taking place in the midst of a wildlife refuge. No doubt a few ducks and gulls that happen to be flying close to the Saturn at the moment of lift-off have been removed from the ecology of the area—but it is most completely and undeniably clear that our feathered friends have *not* been driven away by that noise-to-beat-all-noises. They *live* there. It doesn't seem to frighten them into abandoning their nests, or failing to mate. The armadillos don't seem to

editorial by
JOHN W. CAMPBELL

BALANCE and ECOLOGY

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find that immense racket too distressing. I don't know whether alligators try roaring back at the challenge of the bellowing stranger—but evidently they don't find it intolerable.

The trouble with too many sudden ecologists—the ones that have just suddenly joined the Cause, without bothering to think too much about what ecology means—is that they overlook the fact that those creatures evolved during the last several billions of years in and/or on an Earth that went in for exploding volcanoes, drifting continents, ice ages, hurricanes, tornadoes, and thunderstorms. Earth is indeed a pleasant planet—but nobody in his right mind would call it a *quiet* planet!

I've had fun taking color photographs of various local birds coming to our backyard bird feeder. During the summer, big trees shade it so heavily that the light isn't adequate for stop-action shots on Kodachrome using the available light, so I use a setup with three electronic flashguns to get shots at 1/2000th sec. and the depth of focus that goes with F 8.0.

You'd think that those brilliant flashes would send the birds off in panic—and keep them away. That is, you would if you didn't *think* about it a bit. The observed fact is that usually the birds don't even look around when the flash goes off. The first few times they did cock their heads warily at the click of the camera shutter—but not at the brilliant flashlamps blazing at them from about four feet away. The only one that seemed to have a panic reaction was a cardinal that happened to be perching on the flash unit—waiting his turn at the feeder—when it fired.

How come the birds weren't scared? Well, birds that got into a nervous twitch at every flash of lightning wouldn't do well in Nature, would they? For the last few hundred megayears, birds have been subjected to electronic flash illumination; those sudden, brief flashes of illumination are just one of the eccentricities of the real world, and since it never hurts them—or at least none has ever reported being hurt by it!—they ignore it. Fear of lightning seems to be strictly a human aberration; animals aren't bothered.

Oh, generally animals *are* bothered by old-fashioned flashbulbs and flashpowder; the light flares up too long to resemble the natural phenomenon.

Now let's consider one of the big ecological arguments against the SST—how its terrible noise is going to disrupt the breeding habits of all the animals all across the continent as its shock waves go thundering by.

Wanna bet?

When you send an electric current of 30,000,000 amperes between two clouds, with some 40,000,000 volts difference of potential, it not only makes a very brilliant flash, it generates some super-dooper shock waves in the atmosphere. Those go thundering off across the landscape for miles and miles. Moreover, they've

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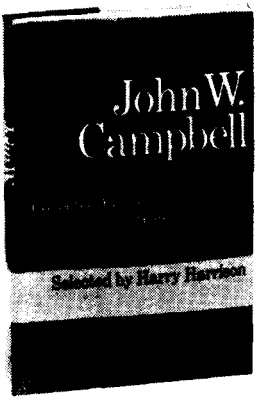

been doing it for something approximating 4.5 billion years, and any animal species that evolved on this planet damn well better be accustomed to it.

Now *you* might recognize it as an SST's shock wave . . . or the vastly louder roar of Apollo taking off—but evidence indicates that ducks, gulls, and assorted other members of the Cape Kennedy fauna don't. Or they don't give a damn. So far as they're concerned, thunder is thunder, and ignore it.

It's true that some of Man's domesticated—or semidomesticated—and caged animals *are* disturbed. But that's due, in large measure, to their being highly neurotic anyway. Ask any mink farmer, or turkey farmer, what he thinks of the rationality of the beasts; the best and most stable ones are acute neurotics, the average ones are psychotic in their irrationality. (Young turkeys die of pneumonia if they get rained on; they haven't got wits enough to come in out of the rain. Since the birds evolved and survived in Nature, evidently the wild birds are a bit more sensible.)

In other words, that ecological argument against the SST seems more than somewhat dubious. Check with the wildlife experts at Cape Kennedy, and see how shock waves affect them. And try finding a wild animal that gets panicked by thunder and lightning as some people do!

continued on page 174

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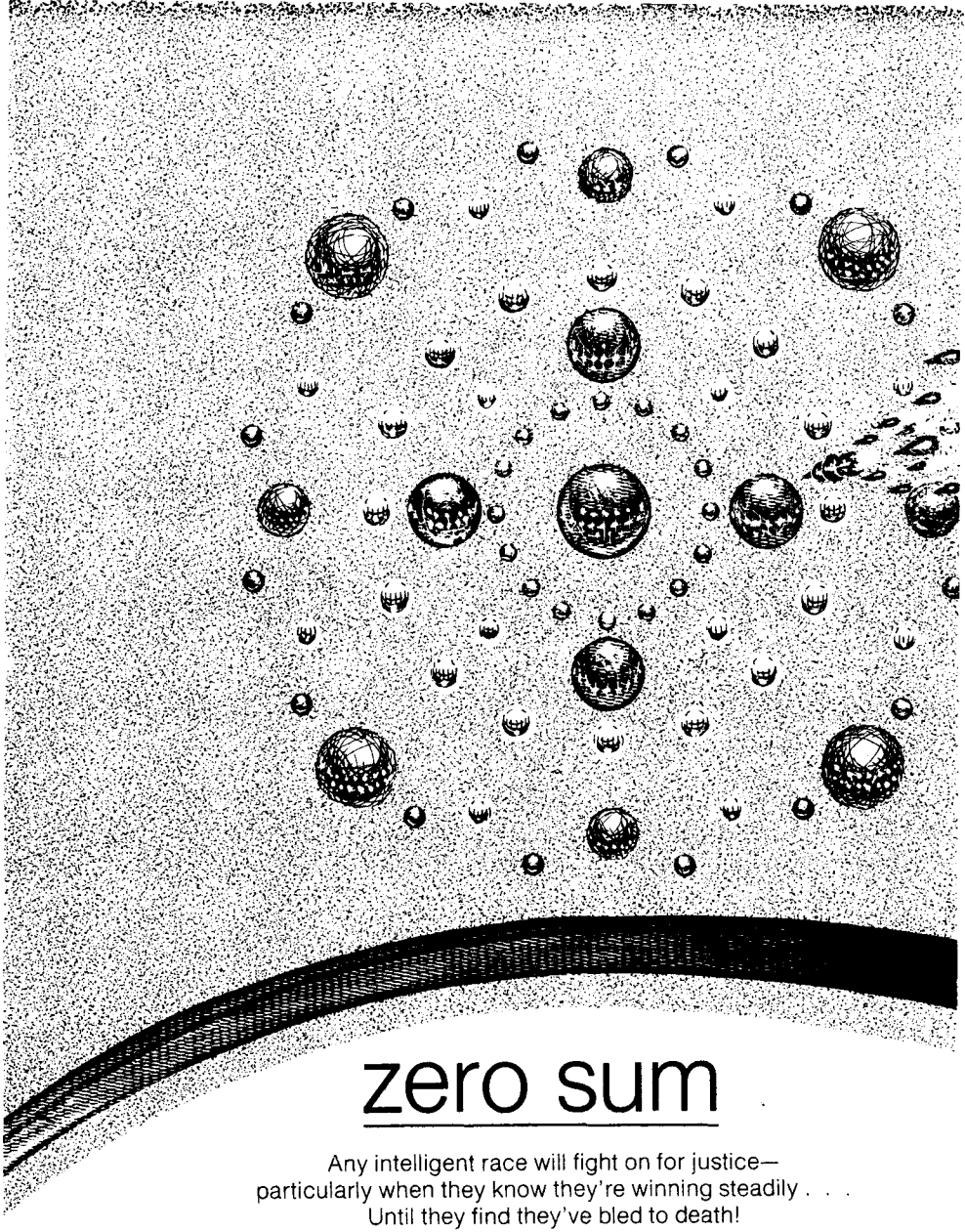

zero sum

Any intelligent race will fight on for justice—
particularly when they know they're winning steadily . . .
Until they find they've bled to death!

JOSEPH P. MARTINO
Illustrated by Kelly Freas

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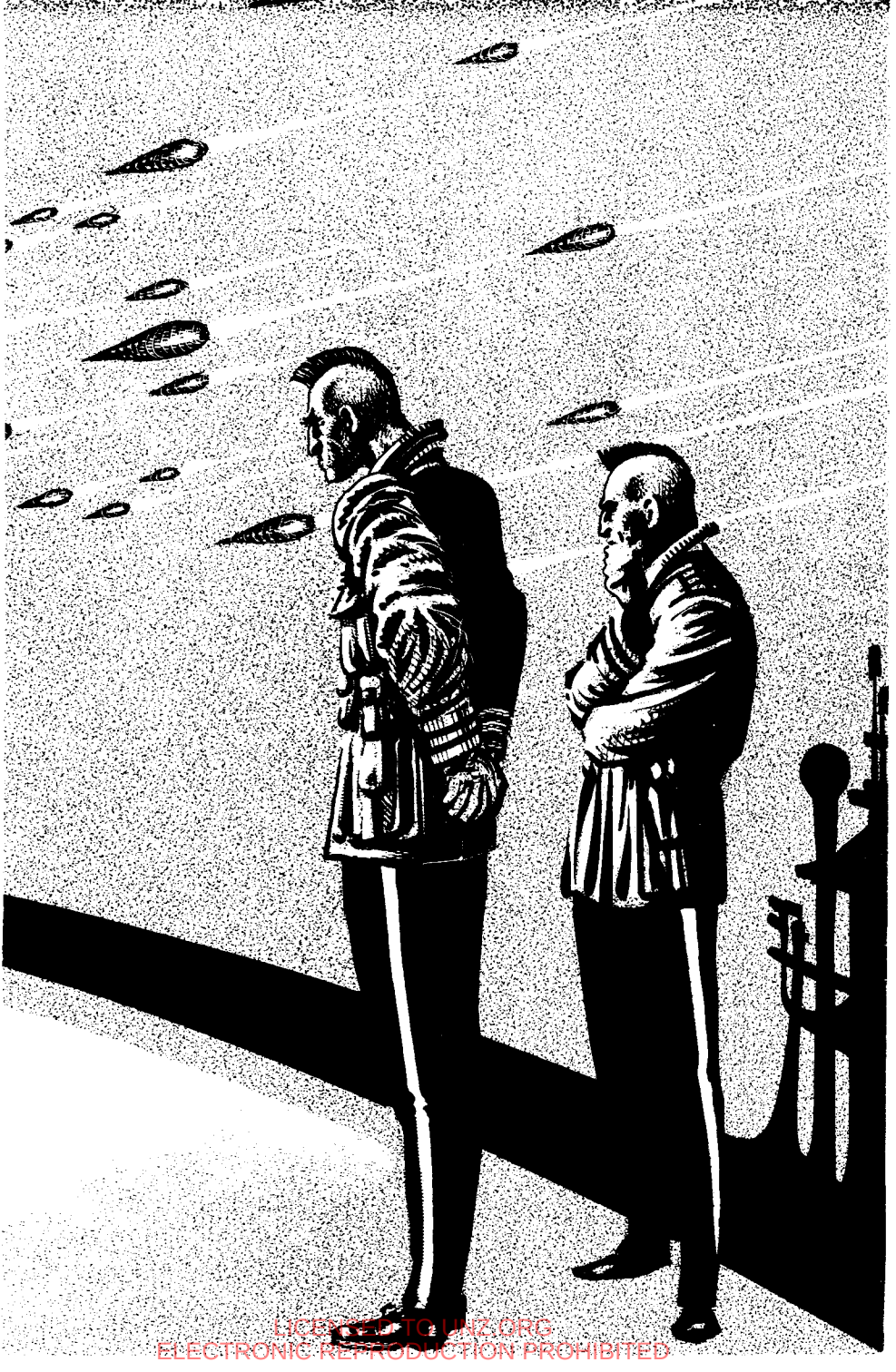

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Commander Arnold Johnson clutched at the console in front of him. The ship lurched, and his pencil rolled across the console's desk top and dropped to the floor. Evidently the Pilot had dodged a Khorilani missile, and the artificial gravity hadn't quite been able to compensate for the maneuver. As he reached down to recover his pencil, the lights dimmed briefly. That one must have burst pretty close, he thought, close enough to draw power from the defensive screens. His ears told him that the ship was still maneuvering violently. The artificial gravity compensation was never completely perfect, and when the ship made vigorous enough maneuvers, his inner ears let him know about it.

He took a look at the hologram tank in his console. The crosshairs still jittered about the white dot that was the enemy ship they were engaging. Evidently the Gunnery Officer, Lieutenant Cheng, still had some missiles on the way, and was still trying for a hit. Then the enemy ship slid toward the edge of the display and disappeared.

Lieutenant Cheng's voice came over the intercom. "This is Gunnery. He got away. No score for either side."

Another voice followed. "This is Damage Control. All compartments still airtight."

And back to work, thought Johnson. He switched the Combat Display to show the disposition of the entire fleet. The hologram tank lit up to show a cloud of white dots, like two star clusters passing through each other. The one going "forward" in the tank was the 27th Destroyer Division of the Terran Space Navy. The other was a force of Monitors of the Khorilani fleet. The two forces had made one firing pass at each other, and would soon be out of range of each other's missiles again.

Johnson quickly examined those ship-to-ship encounters still in progress. The dot representing one Terran ship blinked twice and vanished. The computer was calling his attention to an enemy victory. He tapped a button to one side of the console. Immediately, a display lit up: FRIENDLY—21 SHIPS, ENEMY—19 SHIPS. The fight had started at 25 and 20. But the disparity in favor of the Terran fleet was not particularly comforting. The Khorilani ships were of a class known to Terrans as Monitors. No one knew what the Khorilani called them. The Terrans had no equivalent ships, just as the Khorilani had nothing equivalent to the Terrans' Destroyer class. The enemy used Monitors much as the Terrans used Destroyers, but the ships were significantly different. Destroyers were light, fast, highly maneuverable. Monitors were slower, less maneuverable, and heavily armored. One hit on a Destroyer was sufficient to finish it. One hit on a Monitor would knock it out of the fight, but on the average, two out of three times a Monitor could take a

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hit and still withdraw from the battle area under its own power. Only one time in three did a hit on a Monitor stop it dead in space. So in sheer fighting and staying power, a Monitor was more than a match for a Destroyer. Only the higher speed and maneuverability of the Destroyer evened the balance. Even so, the two forces had started the battle with an uncomfortably even match.

The next question was whether the two fleets should engage in combat once more. The decision was really up to the Terran commander, since the Khorilani couldn't catch him if he decided to run, nor escape him if he decided to fight. And Captain Likhatchov, Commander of the 27th Division, would soon be asking Johnson's opinion as to the next move. Johnson, as Tactics Officer for the Division, was responsible for advising Likhatchov regarding the conduct of a battle. Although Likhatchov had the ultimate responsibility for making all decisions, it was almost unheard of for a Commander to overrule his Tactics Officer.

The Display showed that the two forces had separated completely now. Johnson's ship, the *Arcturus*, flagship of the Division, showed up more brilliantly than all the rest of the ships in the Display. He knew this enhancement was completely artificial, but it still gave him the uncomfortable feeling that the enemy knew which ship was his, and would concentrate on it. The two forces were regrouping. The Terran fleet was taking up its usual conical formation, with the apex toward the enemy. It provided effective interlocking fire for the entire Division, but once the battle was joined, the elaborate formations of both sides would soon dissolve into a series of one-on-one engagements. Each ship would fire a salvo of beam-rider guided missiles at its opponent, hoping to knock out the other ship before being destroyed itself.

The simplest maneuver during one of these engagements was to charge directly at the enemy ship. This made shooting easy, but also provided the enemy with an easy target. The next step in sophistication was to maneuver during the run at the enemy. This made the Gunnery Officer's job harder, but also gave the enemy a poorer target. Best of all was to wait until the enemy was committed to the attack, launch one's own missiles, then reverse course. If the enemy continued his attack, he became the pursuer. He had to drive straight into the missiles of the pursued ship. The pursuer might then be knocked out long before his own missiles reached the pursued. It was Johnson's job not only to recommend whether there should be a fight, but to recommend the tactics by which it should be fought.

But first he had to determine what tactics the enemy was using. During the battle, he had been recording the enemy's tactics on a pad of paper. He had kept up the count until his

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own ship came under attack. Somehow it became hard to concentrate on his job when his own ship was being fired upon. He often envied Likhatchov's coolness under fire. The captain never seemed to show any sign of worry. He kept his attention on the overall actions of his Division, and left the fighting of his own ship up to the Gunnery Officer and the Pilot.

Johnson pulled the pad of paper towards himself. He made a quick count, and found that the Khorilani were using the same set of tactics they had been using consistently since the outbreak of the war. Of course, he could have asked the computer for a detailed analysis of their tactics. However, using the computer this way struck him as akin to using a micrometer to measure a sewer pipe. When he wanted a rough answer, he'd use a rough method to get it. After the battle was finished, he would get a complete, detailed analysis from the computer.

He checked the Combat Display again. His own force had completed its conical formation. The Khorilani force had nearly completed a globular formation. Evidently the Khorilani commander was expecting the Terrans to attack again. The globe was an excellent defensive formation, but nearly useless for an attack, since half the force would be out of range of the point of contact between the forces.

The Khorilani were using the mix of tactics he had expected them to use. The Terran force still had a slight numerical advantage, although not as large as before the first fight. Essentially, however, the situation was unchanged, and the analysis he had made at the outset should still be valid. He would recommend a second attack.

His decision was made just in time. Captain Likhatchov's voice came over the intercom. "Johnson, this is Likhatchov. What do you recommend?"

"We've lost four ships to their one. That's an even exchange; forty-eight men of ours for forty-eight of theirs. That really hasn't changed the situation much. Tactically, we're in about the same position now as we were before, relative to their strength. Slightly weaker, but not much. I recommend a second attack."

"Very well. I'll order an attack as soon as all the ships in the Division have checked in and are ready."

The captain had no sooner signed off than Lieutenant Cheng's voice came through. "Gunnery to Tactics. What do we do?"

"Just a minute," Johnson replied. He opened a drawer in his console, and pulled out an octahedral die. He rolled it in his hand, then spun it across the desk top. It clattered against the front of the hologram tank, bounced back, and rattled to a stop. He counted the pips on the upturned face. Six. He copied the number on his pad of paper, then replaced the die in the drawer.

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"Tactics to Gunnery. We'll reverse course on him."

"Fine. That's the one I like. Too bad we can't do it all the time."

"Right. But if we tried, they'd soon outguess us."

Choosing the proper tactic through a roll of a die, just before the battle, meant that there was no way for the enemy to outguess him, since there was no system, or logic, involved. Of course, he could have had the computer produce a random number for him, just as it could have analyzed the battle for him. But in his mind, that took all the sport out of it. Rolling dice was better. Somehow it was more fitting when risking one's neck.

Suddenly Likhatchov's voice came through the intercom again. Evidently he was using the All-Ships channel, though. "Division, this is Likhatchov. All ships begin the attack immediately. Maintain formation as long as possible. Good luck."

Johnson turned his attention back to the Display. The enemy formation was complete, and waiting for the Terran force. There was no point in their moving toward the Destroyers, to close the distance more rapidly. Instead, they obtained a slight tactical advantage from standing still and letting the Terran force come after them. Undoubtedly the nearer ships had already launched some of their missiles, in an attempt to get in the first blow.

Then the cone was penetrating the globe, and the two formations dissolved. A series of Destroyer-versus-Monitor engagements was shaping up. Johnson started to keep score on the tactics used, as he focused the Display first on one engagement, then on another. Then he noted a Monitor apparently heading straight for the *Arcturus*. He checked with the computer, to verify the two course vectors. The answer came back positive. The *Arcturus* was under attack.

Johnson, of course, had no role to play in the engagement. His task, as with Likhatchov and the rest of the Division Staff on the flagship, was to watch over the entire battle. Nevertheless, his eyes kept stealing back towards the center of the Display, towards the Monitor that seemed to be coming directly at him.

Months ago, at the outbreak of the war, he had found he simply could not keep his attention away from an enemy vessel engaging his own ship. He would tell himself that his duties were elsewhere; he had a responsibility to the men in the other ships to keep track of the whole battle; he must not let the fact he was under fire distract him. Gradually, as the months wore on, he found it possible to push his own situation to the back of his mind, and give at least part of his attention to the overall battle. But it was never easy.

Again, he forced his attention away from his own ship, and focused the Display on another engagement which had just started. But thoughts

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of the other battle were driven from his mind as he felt, rather than heard, the *thump* through the deck-plates that indicated his own ship had launched a salvo of missiles.

He reached for the console, and switched the Display to a repeat of that seen by the Gunnery Officer. The Monitor showed in the center of the Display. A pair of crosshairs jittered about the enemy ship. A cluster of tiny dots indicated the *Arcturus's* own missiles, on their way towards the enemy. The enemy missiles had not yet been picked up by the detectors, and weren't shown. The jittering of the enemy ship resulted partly from its own maneuvering, partly from that of the *Arcturus*. Each ship was feeding to its own drive controls a signal consisting of carefully-chosen pure noise. The noise frequencies were selected to be those to which the other side's missile controls were most sensitive. The hope was to introduce enough jitter into the other side's missile controls to cause a miss.

Abruptly the enemy missiles appeared on the screen. Almost immediately, the image of the enemy ship started to decrease in size, and recede from the *Arcturus*. The *Arcturus* had reversed course. The enemy missiles were now forced into a tail-chase. The enemy ship was driving ahead into the *Arcturus's* own missiles. The *Arcturus* could easily outrace the enemy ship. However, the enemy missiles would eventually catch up with it. Before that, it must kill the enemy ship, leaving the enemy missiles unguided. The first of the *Arcturus's* missiles began to reach the enemy. Points of light blossomed and grew, then vanished. Johnson counted six bursts, then nothing. The first salvo of missiles had missed completely. The enemy ship continued to advance. He again felt a *thump* as another salvo was launched. Then the enemy missiles were upon them.

The lights flickered once, then again, as missiles burst close by, and power poured into the defensive screens. Johnson's inner ears told him that the ship was undergoing violent maneuvers. The lights dimmed once more, and the ship lurched sickeningly. Johnson grabbed his pencil just before it rolled off the console, then clutched the chair-arms to steady himself. Then there was another shudder to the ship, almost too small to be perceptible.

A voice squawked over the intercom. "This is Damage Control. Compartments C-4 and C-5 holed, and all air in them lost. They've been sealed off. No one believed to be in them. All defensive screens remain intact."

Then the voice of the Gunnery Officer came through the intercom. "Tactics, this is Gunnery. We have another salvo on the way. It should be there long before they can get another one near us. I propose to go in straight, no maneuvering. Any objections?"

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Johnson thought rapidly, then punched some numbers into the computer. The answer came back immediately. The odds were about two to one that the *Arcturus* would survive the engagement. Johnson decided the chance was worth taking.

"Tactics to Gunnery. Go ahead, but be ready to break off and start evasive action if you miss. I don't think we'll have time for a third salvo."

"Right. I agree," Gunnery replied.

Johnson switched his Display back to the fleet disposition. He observed that the battle was almost over. Most of the Terran ships had passed through the Khorilani formation, and were regrouping. Several engagements were still in progress, however. Close examination showed no apparent shift in enemy tactics. He then switched back to the Gunnery Display. He saw that the *Arcturus's* last salvo was reaching the enemy ship. Several missile-bursts blossomed near the enemy ship, then one seemed to blot it out.

"A hit! You got a hit!" Someone's voice called over the intercom.

"Right," Lieutenant Cheng's voice came back, "but she's still moving. She's out of the fight, but she's not dead. She'll be back to fight again."

But by then the *Arcturus* was drawing out of range. There was no chance to finish off the crippled ship. And Johnson had to face the question of whether the Destroyer Division should make another attack, or break off the action. Likhatchov was going to want some advice soon, on what to do next. Quickly he started the computer reading out its analysis of the battle. He had better not keep the captain waiting. The force size display showed: FRIENDLIES—18 SHIPS, ENEMY—18 SHIPS. Right away he didn't like the looks of that, and the computer agreed with him. There was one chance in five that the outcome of a third engagement would be completely disastrous. He got his answers back just in time, as the intercom again blared.

"Johnson, this is Likhatchov. What do you recommend? Shall we attack again?"

"I recommend against it, Captain. They've got us matched ship for ship now. We've lost eighty-four men, they've lost ninety-six. That puts us ahead by the equivalent of one Destroyer crew. Let's be satisfied with this victory, and not risk turning it into a defeat."

"That makes sense. I'll accept your recommendations." There were some clicking noises, then the captain's voice came on again. "All ships! Break contact, and reform for withdrawal!"

In the Combat Display, the white dots sorted themselves out and coalesced into two separate constellations again. The enemy might have wanted to avenge his defeat, but he had no chance of catching the faster Destroyer force, if it chose to withdraw. The two constellations reformed into tight globular clusters and separated from each other. After

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a long while the enemy force disappeared off the edge of the Display.

"All ships!" Captain Likhatchov's voice boomed through the intercom. "Stand down from Battle Stations. Resume normal Watch rotation." Then, after some more clicking noises, Likhatchov spoke directly to his own Staff. "Division Battle Staff. This is Likhatchov. Please report to my quarters as soon as you secure your battle stations. The ship's Medical Officer will report to me also."

Johnson had the computer run out for him all the detailed statistics Fleet Headquarters would want in his formal report on the battle. When he was satisfied the report was complete, he released it for automatic transmission to Headquarters. At last he turned off his console and locked it.

He reached Likhatchov's quarters just as most of the Battle Staff were leaving.

"Go on in," Lieutenant Cheng told him. "He had something different to say to everybody. We left when he finished with us."

Captain Likhatchov was seated in one of the three chairs in the little compartment his rank entitled him to. "Hello, Arnie. Please sit down." He pointed to a samovar on a small table. "Care for some tea? Or shall I have the kitchen send you up some coffee?"

"Tea is fine, thanks. I'll help myself."

He poured himself a cup, sat down, and waited. As far as he was concerned, it was the captain's next move.

Captain Likhatchov picked up a message form and held it out towards Johnson. "We've got some new orders. There's been another fleet action nearby. About two hours' run from here, at top speed. There's a damaged enemy ship there, presently being guarded by two Destroyers. In addition, one of our Cruisers is damaged, but is still reparable. Fleet Headquarters wants the enemy ship retrieved, so they can study it. In addition, of course, we want to recover our own Cruiser and patch it up again. So we're to escort some tugs to the two locations, wait until they take the two ships in tow, and then escort them back to the nearest Fleet base."

"That's about a five days' trip, isn't it?"

"That's right. The tug captains estimate just over five days to make the trip with their tows. Several of our ships have sustained some battle damage, so I expect we'll be allowed some ground leave while they're being repaired."

"The crews will like that."

"Yes, I imagine they will. Anyway, I'll want you to work out some tactics for protecting the tugs. It will be a different situation from what we're usually involved in, and different tactics might be called for."

"Yes, sir. I'll set up a Game Matrix and see what comes out of it."

At that moment they were inter-

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rupted by Commander Manuel Chavez, the ship's Medical Officer, coming in.

"Good day, Manny. I'll be finished talking with Commander Johnson in a moment. Help yourself to some tea and sit down." Likhatchov turned his attention back to Johnson. "Now, how did we do today? Never mind the detailed statistics. I know they're your bread and butter, but I just want your overall evaluation."

"I'd say not badly, sir, considering that we tangled with a force of Monitors, numbering almost as many as our own force. We did pretty well to inflict that much damage, while suffering no more losses than we did."

"Did our results measure up to the Fleet-wide average?"

"Strictly speaking, you can't apply Fleet-wide averages to an action this small. But even so, we did better than my Game Matrix predicted at the outset."

"What about the enemy? We usually come out ahead in a battle like this, when we have more ships than they do. Why didn't they withdraw? They couldn't have got away if we wanted to press the attack, but they could have forced us to chase them. That would have given them a significant tactical advantage."

"I can't explain it, sir. I don't understand their motives at all. When they persist in using such bad tactics, time after time. I don't even try to explain their other actions."

"What's this? Their allegedly bad tactics? You've been talking about that since the beginning of the war."

"But it's true. Before each battle we compute the best mix of tactics for our own forces. That way we're guaranteed a certain ratio between their losses and ours, on the average, even if they use their best possible tactics. But we always come out slightly better than expected, because they don't use their best possible tactics."

"Maybe they're just inherently poor tacticians."

"If their tactics varied all over the lot, I could believe that. But they don't. They always use the same set of tactics. The mix is wrong, but they always use it."

"So, here we are back to your old argument again."

"That's right, sir. The fact that they always use the same mix of tactics indicates to me that they're using something like Game Theory to compute it. But why do they come up with the wrong answer? And why can't they see it's the wrong answer, when their losses are consistently higher than they need to be?"

"Well, let's hope they keep on being wrong. As the FM argued, it will help shorten the war." He turned to the Medical Officer. "Manny, I didn't have a whole lot for you. It's just that there will be some wounded men on one of our Cruisers that's been damaged. We're supposed to escort it back to base. Their sick bay may not have room

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for all of them. I'd like you to check into having some of them moved into our ships if necessary."

"Yes, sir. I don't think it will be any problem. I'll get on it right away."

"Fine. Anything more, either of you?" He looked from Johnson to Chavez and back.

"No, sir," they chorused, and stood up to leave.

Once out in the corridor, Chavez asked, "You're back on your 'wrong tactics' theme again?"

"I'll probably be on it until the end of the war, unless they quit fighting this way before then."

"I've heard you expound on it before, but I confess I don't understand it. Higher mathematics always left me cold."

"But it's not really that difficult. Look, there are only three basic tactics you can use in ship-to-ship combat."

"Yes, I remember them from my basic training. Straight-on attack, maneuvering attack, and course-reversal."

"Right. Each one has its advantages, but there's a specific counter-tactic for each one, too. If you used any one of them all the time, the enemy would soon learn that fact, and always use the proper counter-tactic. So you mix them up. Game Theory tells you the proper mix, and in a specific case, you choose one by some chance device. I use an octahedral die I had made up specially in Luna City. It gives the proper odds for a Destroyer versus Monitor engagement.

"Anyway, the point is there's one best mix of tactics, and you can't improve your situation by deviating from it. In fact, if you do deviate, your average losses increase. The way we figure it, on each engagement between a Destroyer and a Monitor, on the average we should lose three quarters of a man less than they do. Instead, their losses average one and three eights man per engagement more than ours. And the reason is they're using the wrong mix of tactics. If they'd use the right mix, they could cut their losses, and there wouldn't be a thing we could do about it."

"So that's what the First Minister meant, in that recorded briefing, that the Khorilani losses were twice what had been predicted."

"That's what he said, but somehow he'd got it wrong. It's not their total losses that are twice the original predictions, it's only the excess of their losses over ours that's almost *twice the original predictions*. That's a far different thing."

"Still, it indicates we're doing well, doesn't it?"

"That it does. It's just so puzzling, that they should stick to such bad tactics. They must know something about Game Theory. Why don't they use the right mix of tactics to lower their losses?

"Well, here's my cabin. I'm going to rest for a little while, before we reach

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the ships to be towed back to base."

"O.K. I've got to call the other ships' Medics about their unused sick bay space."

Johnson entered his tiny cabin and closed the door behind him. He pushed the one chair up to the desk, closed the door to the lavatory, and folded his bunk down. He lay down and consciously forced himself to relax. The intense concentration of a battle always drained him of nervous energy, and he'd need to be rested in case the Division had to face another fight soon. The words of the Medical Officer came to the fore of his mind. He hadn't thought of it for some time, but perhaps no one had ever told the First Minister of his mistake. But it was down on tape, and by now must have been played for every man in the Fleet, and probably in the Army, too.

The war had started out as a series of border clashes. Little had been said about them officially, but as ships touched down at ports, the word was spread from friend to friend. So Johnson hadn't been completely surprised the first time the Division received orders which sent it into combat against a unit of the Khorilani fleet. Later, they had been ordered to patrol a region of the space between the human and Khorilani spheres of influence, and had a brief skirmish with another intruding Khorilani unit before it withdrew towards its own territory.

Then one day, while cruising along a well-traveled shipping route near the border, the Division had been overtaken by a courier ship. The courier was carrying tapes which were to be played for all crew members. The Division halted in space, and half the ships stood down from watch, while the other half remained on alert. Since all the routine functions of the ship were completely automated, the entire crew of eight officers and four enlisted maintenance technicians crowded into the ship's mess. The Display which filled one wall, and which was usually used for entertainment tapes, showed the tape the courier ship had brought.

The tape opened with a shot of the Chief of Naval Staff, seated at his desk. The Seal of the Terran Space Navy hung on the wall behind him, and his desk was flanked by the flag of the Terran Confederation, and the Admiral's own five-star flag. The camera zoomed in, focusing on the chief's head and shoulders.

"Men and women of the Fleet," he began, "some of you have already been in combat with units of the Khorilani forces. Many of the rest of you have heard that there has been some fighting. Undoubtedly you have wondered why. To help you understand the issues, I want you all to see the following recording. It shows a debate in the Terran Parliament, in which all the issues were discussed fully. It should assure you that the cause in which you are fighting not only is just, but has the sup-

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port of the rest of your race. Your diligent efforts are required to defend the homes of your fellow humans, and to bring this war to a successful conclusion."

The camera held on the Admiral's face, with its grim expression, for a few moments. Then the view expanded to show the Seal and two flags again. The display blanked out, and then showed a large room. There was no need to identify it. Virtually any human of school age, on any of the worlds of the Confederation, would have recognized the interior of the Lower Chamber of the Terran Parliament. The floor was packed. Every Delegate, from every one of the human-settled worlds, was in his place, as well as every Alternate who could find room. The camera panned along the galleries, showing them to be filled with the great, the near-great, and anyone else who could wangle a pass out of his Delegate. The camera then zoomed in on the First Minister, who was standing at the Speaker's rostrum.

"I'll bet this is going to be a lot of political nonsense," Chavez growled.

"It's bound to be pretty political," Johnson replied. "He's got to defend the conduct of the first big war we've had in thirty years. And the fact that there's a large minority of the human race who question whether the war was necessary in the first place, doesn't make it any easier for him."

"Bah!" Captain Likhatchov snorted. "Anyone who's been shot at as much as I have, even if it's mostly border clashes and piracy suppression, is against war, too. But sometimes you have to take a stand or you get walked over. The Khorilani have to be shown we deserve some respect."

Then the First Minister's voice boomed out. "Good morning, ladies and gentlemen. I'm pleased to have this opportunity to tell you, directly, about the course of our war with the Khorilani, and to ask you for your support in a more vigorous prosecution of this war.

"To start with, there has been a lot of defeatist talk to the effect that we're suffering losses that are too high; that a few planets aren't worth that many lives. I want to scotch that kind of talk right now. I assure you that none of you is more concerned than I am about the lives of our brave young spacemen and soldiers. Each one killed is a tragedy, a tragedy that I feel just as deeply as though I had known him personally.

"Before we decided to declare war, the Minister of Defense and I very carefully went over the casualty estimates prepared by the Services. Both Chiefs of Staff agreed on a particular plan for the campaign, and estimated both our casualties and those of the enemy. Even though their estimates showed that the enemy losses would be higher than ours, we pondered long and hard before agreeing to go to war. We finally decided that the long-term

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threat was high enough that we had no choice but to fight.

"Despite the tragedy of the war, however, I am happy to report that our losses are slightly lower than the original predictions of our military men, while the enemy losses are nearly twice what they had originally predicted. The enemy cannot long continue the current unfavorable casualty exchange rate. He will have to sue for peace, probably much sooner than we had originally predicted. The war is going very well for us, and . . ."

"What's that?" Johnson burst out. "That's a complete distortion of the true situation on the casualty exchange ratio."

"Keep it for later," Likhatchov snapped. "Let's hear what he has to say."

The voice of the First Minister continued. ". . . Facts will, I hope, bring an end to those voices of timidity which are downgrading the sacrifices of our brave fighting men, and encouraging the enemy to think we don't have the stamina to continue the fight.

"Now I will entertain questions from the members of either Chamber. All the members of the Cabinet are here"—he indicated a row of men and women seated behind him—"in case they are needed to provide detailed answers to any of your questions. The speaker of the Upper Chamber will recognize Members who wish to ask questions."

The Speaker slowly walked up and took a position beside the First Minister. The camera showed him examining the panel of lights behind the rostrum. A larger replica of the same panel, on the wall behind the rostrum, showed a whole constellation of lights, from Members who had asked for recognition. Some words passed between the First Minister and the Speaker, too low for the microphone to catch. Then the Speaker intoned in his voice of practiced authority, "The Chair recognizes the Senior Delegate from Terra, Pierre LeBlanc."

The Terran Delegate rose from his place with ponderous dignity. He reached for a piece of paper on his desk, and held it up before him.

"The FM must feel pretty confident," Johnson muttered. "He's giving the biggest voice among the Opposition first crack at him."

After a pause, the Terran Delegate spoke. His voice came in slow, precise syllables. "Thank you, Mr. Speaker. I have a question for the First Minister. To save time, a number of Delegates have agreed to let me ask the question which is concerning all of them. This is a sizable number of Delegates, I might add. It includes not only most of the Terran Delegation, but many Delegates from the colony worlds, such as Mars and New Texas. In all, we represent nearly a fourth of the human race. And I am sure that many additional Delegates have the same question. We simply did not have time to include them in our discussions. In

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all, I daresay that over half of humanity must be wondering about this same question.

"You have told us that the war is going well. We are killing more of the Khorilani than they are killing of our young men and women. You have even told us that in the long run these disputed planets are worth more than the lives we are expending for them. Let us assume, for the moment, that these things are true. You still have not answered the fundamental question. Is war the only way we could have settled the issue? Could we not have reached some compromise with the Khorilani, through diplomacy and negotiation, which would have assured both sides a reasonable share of the disputed planets, without any loss of life on either side? As a gesture of goodwill, to assure better relations with the Khorilani in the future, why could we not have accepted somewhat less than what we considered our fair share of the disputed planets? In short, was this war the only answer?"

The view in the Display expanded to show the whole Chamber. LeBlanc's question was receiving applause from Delegates in all quarters.

"That's why the FM let LeBlanc get in the first question," Likhatchov said in a low voice. "A lot of the Delegates were wondering about that. They wouldn't pay attention to anything anyone says on any subject as long as their mind's on that one."

"The FM's a shrewd politician, no doubt of that," was Johnson's reply.

As the last scattering of applause died out, the camera zoomed in on the First Minister. "I assure you," he began, "that had any possibility of compromise remained open, we would have explored it before making the decision to go to war. We concluded there simply was no other choice. To set your minds at ease on the question, however, I would like the Minister for Nonhuman Affairs to describe for you the negotiations we attempted to carry out with the Khorilani before we concluded there was no alternative to war."

He stepped down from the rostrum, and moved to the side opposite the Speaker. One of the men seated behind him rose from his chair. The camera focused on him and followed him to the rostrum.

The Minister for Nonhuman Affairs spoke up. "Thank you," he said as he nodded to the First Minister. Then he turned toward the Chamber. "Perhaps I feel the tragedy of this war more than any other member of the Cabinet. To me, more than to any other except perhaps the First Minister, it represents a personal failure. Despite the best efforts of both myself and of the best professional negotiators of the Extraterrestrial Service, war could not be avoided. Yet I don't see anything more we could have done, any opportunity we did not follow up.

"Let me review the situation for

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you. The human and Khorilani cultures have been expanding towards each other for well over a century. Other than occasional sightings of each other's ships in space, and instances of one of us finding the other's installations on a planet we had planned to colonize, there has been essentially no contact between the races. Until a decade or so ago, probably not over a dozen humans had even seen a member of the Khorilani race, and these contacts were brief and of no lasting importance. Finally, however, the two races ran into each other in the same region of space. There is simply no more room for either of us to expand in that region. The two zones of influence have finally come in contact. There are approximately twenty star systems in the region of contact. Several of them have planets that either race could colonize. Both we and they want to colonize those planets. We have, of course, faced this same problem with two other nonhuman races in the past, and solved it peaceably. Therefore, when the issue finally came to a head two years ago, both I and my staff had considerable confidence that this conflict could be settled peaceably, too."

He turned and nodded toward the First Minister. "As the First Minister has told you, we tried to negotiate with the Khorilani. I won't bother to review for you the means by which we managed to communicate to them that we wanted to hold a conference to negotiate the issues, nor the problems we encountered in finding ways to communicate with them at a conference. I will simply say that we did overcome the difficulties, and one year ago we did, in fact, convene a conference. I attended most of the sessions myself, once I was assured that the chief Khorilani delegate also represented their rulers directly.

"In the preliminary groundwork which led up to the conference, we received the distinct impression that the Khorilani understood the concepts of negotiation and compromise. Their equivalent notions seemed to have more of the idea of optimization than of mutual adjustment, but there seemed to be enough commonality of concept that we could conduct meaningful negotiations. So we entered the conference with the idea that there would be some haggling and horse-trading, but that the outstanding issues would eventually be resolved amicably, and in an almost routine fashion."

"That's no lie," Likhatchov growled. "They even cut the Defense budget that year. We're paying now for that cut; paying in both Solars and lives."

The Minister continued. "At the first negotiation session, we presented a proposed division of the worlds in the disputed area. We had based our division on the habitable land area of each planet. We had taken into account not only the number of square kilometers of land sur-

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face on each planet, but the climate, length of year, and so on. Based on the most complete information we had about each world, in particular its desirability for colonization, we had made as equal a division of the worlds as we could. We would actually have been happy with either half of our proposed split, but we proposed that we be given that group contiguous with the human-settled region of space. We assumed there would be some changes in the split, based on proximity to worlds already settled, organization of efficient trade routes, and other such factors. But we felt we had made a proposal which was a good start toward a peaceful compromise. We simply weren't anticipating the way things turned out.

"The Khorilani started out by making a counter-proposal of their own. In itself, there was nothing wrong with this. We didn't consider that there was anything sacred about the way we had proposed to split things up. There were a lot of possible ways of combining those planets into groups of about equal value. The thing that dismayed us was that their division showed no attempt to produce an equal split. Their split would have given them over three quarters of the desirable land area. My reaction, when I saw their proposal, was that they were hard bargainers, and that they had taken an initial position which left them plenty of room for maneuver."

The Minister stopped, searched under the rostrum, and came up with a pitcher and a glass. He poured some water, took a sip, and went on. "So we made another proposal. This one was also a nearly equal split of land area, but made some concessions to them in terms of a more compact clustering of planets, and so on. We considered it as being somewhere between our original proposal and their counter-proposal. It was an attempt to give them a little without hurting ourselves too much. But we finally had to conclude they weren't interested in working out an agreement. Oh, they went through the motions. Every time we made a proposal, they made a counter-proposal. If they had been interested in agreeing, their proposals and ours should have converged. Eventually we should have reached something acceptable to both sides. But instead, their proposals and ours diverged. Every time we gave any concessions, their next proposal demanded more.

"Their final proposal was the last straw. Out of that whole collection of planets, they offered to give us one single system, consisting of two planets. One was an airless planet about the size of Mercury, and the other was a Jovian supergiant. All the colonizable planets they wanted to keep for themselves. It was with deep regret that I concluded they weren't really interested in coming to an agreement. So after discussions with the First Minister and the remainder of the Cabinet, I broke off negotiations. We then selected a

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group of worlds which had about half the total habitable land area, but which was compactly arranged, giving advantages for both defense and trade. We proceeded to colonize those planets, using the Fleet to protect them, and to attack those Khorilani installations which appeared to pose a threat to our new colonies. This led to the current war, which both Chambers of Delegates have supported with supplemental appropriations as we have requested them.

"Again I express my regret that war was the only way out. But I sincerely feel we tried everything we could do, short of simply surrendering those worlds to them. I don't believe any of you would have had us do that."

The Minister for Nonhuman Affairs stepped down from the rostrum. The camera panned throughout the Chamber, to show Delegates in all quarters applauding vigorously. When the applause had died down, the camera returned to focus on the rostrum. The First Minister stepped up to take his original place, and the Speaker moved close to him. Again there was a flashing of many lights on the panel behind the rostrum. After another brief discussion between the First Minister and the Speaker, the latter intoned his decision to the Chamber.

"The Chair recognizes the Delegate from Novo Chuvash, Yuri Dubronov."

The camera swung over to show Dubronov, and zoomed in on him. Slowly he levered himself to his feet with his left arm.

"The FM's let the Opposition have their say, and neatly shot them down," Likhatchov muttered. "Now he's bringing up his own people."

"Do you know Dubronov?" Johnson asked.

"Only by reputation. Novo Chuvash may not have as many people as Terra, but it's got fully as much habitable land, and we're spread out all over it. But he's well-liked all over the planet. He lost that right arm in a little so-called police action about ten years ago. Left the Navy and went into politics. I've voted for him ever since. Novo Chuvash will probably elect him Delegate as long as he wants the job."

Dubronov swung his eyes over the entire Chamber, then faced the Speaker's rostrum. "Thank you, Mister Speaker. I have no questions, but I wish to make some comments. What we have been told by the Minister for Nonhuman Affairs shouldn't have come as a surprise to anyone in this Chamber. Anyone whose interests manage to extend beyond the atmosphere of his own little world should have been fully aware of all the details the Minister gave us. Now no one, even those who devote their attention only to matters close to them, can claim ignorance of the facts. We've heard from one of the leaders of those who can't see beyond the clouds over their own heads. They even claim to

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represent some of the colony worlds. Colony worlds!" Here his voice filled with scorn. "Mars! New Texas! Colony worlds indeed. Those haven't been colony worlds for over a century. We know what they are. They're fat-cat worlds, interested only in getting and keeping more Solars."

He turned to face LeBlanc directly. "You claim to be concerned about the lives being lost to defend the new worlds humanity has colonized. What do you know about lives being lost? It is the colonies which supply most of the men to the Services." He waved his stump of a right arm at LeBlanc. "We in the colony worlds are no strangers to fighting. Check the recruiting statistics, if you wish. Novo Chuvash alone will supply more recruits to the Navy than will all of Terra, with its huge population. You're not worried about lives, or you'd have said something during all the years of border clashes and pirate raids. Suddenly you're worried that this war is going to cost you some money. But you're ashamed to say that, so you talk about lives."

He turned again to face the Speaker's rostrum. "Fellow Delegates, we cannot allow this hidden appeal to cupidity to win the day. Expansion and colonization are essential to the survival of humanity. The day we lack the courage to expand, we will have taken the first step towards extinction. We will turn our minds inward, to the petty concerns which surround us daily, and forget the things which brought humanity to where it is today. Our expansion should be peaceful as long as this is possible. We must share the Universe with the other races who live in it. We must treat them fairly if we expect fair treatment in return. But we must never hesitate to fight for what is rightfully ours, or we shall take our place in history alongside the Terran dinosaurs and elephants, while the stars go to more vigorous races." The view in the Display expanded to show the entire Chamber exploding into applause. Delegates all over the floor were standing and cheering. The guards in the galleries gave up trying to keep the visitors quiet. After a long while the applause finally died down.

After that it was a complete rout for the opponents of the First Minister. A few more Delegates tried to echo LeBlanc's questions, but it was to no avail. The colony worlds, especially those near the disputed area, spoke eloquently for expansion and colonization, and in favor of enforcing the rights of humanity against the Khorilani, with force if necessary. The ultimate decision was an overwhelming vote in support of an expanded war. Then the tape came to an end, and the Display went blank.

Johnson remembered thinking, as he left the mess, that the whole episode had probably been staged by the First Minister, with the careful planning of the best psychologists

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and sociologists the Expansionist Party could obtain. It had all the earmarks of something carefully tailored to appeal to the emotions of the masses. But since the masses were going to supply the lives and the money the war would cost, their support was essential.

Probably, Johnson mused, the First Minister had been told that his statement about relative losses was in error, but there was no point in admitting it publicly. But why, why, why, he asked himself, haven't the Khorilani changed their tactics? In the six months since the FM made his statement, the intensity of the war had been stepped up severalfold, but the only effect had been to change the absolute level of casualties on both sides. The exchange ratio still favored the Terran forces, and by the same amount. And no one could offer any reason to explain why the Khorilani persisted in their less-than-optimum tactics. Their Game Theory specialists ought to be just as capable of computing the right Grand Strategy as those in the Terran forces.

Well, he told himself, maybe we'll find out when the war is over. In the meantime, there's work to be done. He got up from his bunk, stretched, and then folded the bunk back into the wall. Then he returned to the compartment housing his battle console, unlocked it, and set to work devising the best tactics to defend the tugs they would be escorting.

Johnson watched the captured enemy ship drift in from the edge of his Display. The Division was approaching it rapidly, still maintaining the formation he had prescribed, with the tugs at the center. As soon as they reached the captive vessel, the two squadrons of Destroyers in the Division would take up another formation, to provide maximum protection to the tugs while they were taking the enemy vessel in tow.

He switched the intercom on, and called Lieutenant Friedrichs, the Division Intelligence Officer.

"Hans, this is Arnie. I'm trying to estimate the likelihood of an enemy force showing up while we're here. I imagine if a large force had been dispatched to this area, it would be here already. But how about some tugs and an escort? Are we likely to run into an enemy force on a recovery mission similar to our own? Or perhaps just trying to rescue the crew?"

Friedrichs's voice came back. "Just to refresh my memory, I checked through my files on that sort of thing. So far as we can tell, the enemy never rescues the crewmen of a damaged ship, unless the ship itself is worth salvaging. We have seen cases of the enemy recovering ships that appeared to be reparable. But we've never seen the enemy trying to rescue a crew from a damaged ship, or from one downed on a planet, even when there wasn't much of a threat from our own ships in the area."

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"Just one more difference between, I guess. I know of people who've been rescued literally from under the noses of the enemy. We make a real try at rescuing our people. O.K., I guess we'll either face a big force or none at all, and none at all is the most likely situation. Thanks."

He then switched to the Command Channel, to keep abreast of the current situation. There was some talk back and forth among the ships of the Division, mostly about station-keeping and maneuvering. Then he heard Likhatchov's voice going out.

"Calling TSN Ship *Algol.* This is Likhatchov, on the *Arcturus.*"

The Algol? Johnson thought. *That's not one of our ships. She must be one of the ships standing guard over the captured enemy ship.*

Almost immediately, a message came back. "Calling *Arcturus.* This is Hsing, on the *Algol.* You're right on schedule. You have the tugs with you?"

"Yes, we do. What is the condition of the enemy ship?"

"We've seen no sign of activity since we took up watch over it. The ship appears completely inert. She doesn't seem to be too badly damaged, but even so I doubt very much if she has anything but emergency power for lights and communications. And she certainly has made no attempt to signal us."

"You haven't attempted to board her?"

"No, we haven't. Any boarding party we sent would be outnumbered even if half her crew were already dead. I didn't want to risk it."

"Well, the tugs can't hook up until we're sure the crew is not going to put up any resistance. They have no defensive screens up, I presume?"

"None at all. As I said, she's completely inert."

"Very well, then, here's what we'll do. I'll draw up my ships in formation around her, but well away. Then I'll want your two ships to move away. I'll make up a boarding party of at least ten men, drawing from several ships. They would still be outnumbered, but I don't expect them to have to put down any organized resistance. They ought to be capable of overcoming any die-hard individuals. If the remaining crew members put up organized resistance, our boarding party will withdraw, and we'll sterilize the ship with a burst nearby."

"If she turns on her defensive screens, they'll protect her from the radiation of a near burst."

"True enough. Then as soon as our boarding party is out of the way, we'll open up with a bombardment heavy enough to knock her screens down."

"Very well. The plan does leave some risk. They might be playing possum, and manage to hit one of our ships before we silence them. But I have no alternative to suggest. With only two ships, I didn't even

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have enough force available to try anything except keeping watch on them."

"I imagine if they had any fight left in them, they would have opened up on your two ships before we got here. They must have realized you were waiting for reinforcements, and that the odds against them were going to get worse, and not better."

"They may have been waiting for reinforcements of their own."

"On the basis of what my Intelligence Officer tells me, I've pretty much discounted that possibility. We can't ignore it completely, so we're going to be prepared to fight off any attackers who may show up. But we've never captured a ship of this class before, and Fleet Command thinks it's worth some risk. I'll call you back later. I've got to get a boarding party made up."

As soon as the channel was clear, Johnson called the *Algol* and the *Polaris,* which turned out to be the name of the other ship, and informed them of the tactics he had planned for use in case they were attacked while the tugs were hooking up. Then he switched back to the intercom. He caught the tail end of a conversation between the Gunnery Officer and Captain Likhatchov, then heard the Medical Officer come on.

"Captain Likhatchov, this is Commander Sanchez."

"Yes, what is it?"

"I request permission to accompany the boarding party onto the enemy ship."

"But why? If the boarding party takes casualties, I'd expect to evacuate them for treatment."

"I wasn't thinking of casualties. I was hoping to indulge my scientific curiosity. You don't plan to remove the prisoners from their ship, do you?"

"No. As long as the ship is still habitable for them, I'd rather keep them on it. Even though they are oxygen breathers, I'm sure they'd be more comfortable on their own ship than on one of ours, and they'll be much less trouble."

"That's what I thought. Well, I'd like the chance to observe them under as normal conditions, for them, as possible. Biologically and medically, we know almost nothing about them except that we and they can live on the same planets."

"All right. I think the risk is minimal. Just remember, you're not to get involved in any fighting. The Fleet is too short of good Medical Officers to allow you to try any heroics. Be at Lock Number Three, in your suit, in ten minutes."

Johnson watched the formation of his Display. The ships were holding position well, and making the occasional random shifts required to keep the enemy guessing. By now the captured enemy ship was completely englobed. One of the other ships had provided a gig for the boarding party, and it had been threading its way through the forma-

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tion, picking up one or two men from each of several ships. Now it was headed for the enemy ship in the center of the formation.

He switched to the channel Likhatchov would be using to communicate with the gig. He didn't take his eyes off the Display, however. One wiggle out of that enemy ship, and suddenly the job of coordinating the fighting and maneuvering of twenty ships fell on his shoulders. The channel carried nothing but the soft rush of static from the distant stars. Then a voice came on.

"*Arcturus,* this is Ngomo." Commander Ngomo, from the *Fomalhaut,* was in charge of the boarding party.

"Go ahead."

"We're now ten kilometers from the ship. We've halted here temporarily, to see if there was any reaction from the enemy. There has been none in thirty seconds, so we're going in closer."

Again the channel carried nothing but star noise. Johnson watched the tiny dot of the gig creep forward in his Display. He blew up the image, to show only the gig and the enemy ship. Even on this smaller scale, the gig seemed to inch forward, exuding caution. Ngomo was a good choice, Johnson reflected. He was well-known as a man who planned ahead thoroughly, and never risked being caught by surprise. Johnson watched the gig as it crept toward the enemy ship, then returned the Display to a view of the entire formation. As long as he was on duty at the Console, he couldn't allow himself to be distracted from the main job. On this scale, the gig almost seemed to be touching the enemy ship.

"*Arcturus,* this is Ngomo. I'm now stopped a kilometer from the ship. Still no sign of any activity. I can make out a lock on the near side, and a short distance aft, there's a hole blown through the hull. I'm going to try to open the lock. If that doesn't work, I'll go through the hole and blow my way through a compartment wall, if necessary."

"This is Likhatchov. Go ahead."

The two dots merged on the Display. Johnson expanded the view again, and watched as the gig drew up to within a few meters of the enemy. Then he switched back to watching the whole formation. The moment the gig made contact was the most likely time for a surprise move from the enemy, and he had to be ready. For a long moment, he watched the single dot representing the gig and the enemy ship.

"*Arcturus,* this is Ngomo. The outer lock opened when we worked the controls. We're going in."

Johnson threw a switch, and a clock readout was superimposed on the Display. The ghostly numerals floated across the image of the formation, with the hard white dots of the ships passing through them. The counter added up the seconds with agonizing slowness. Three times the seconds crawled up to sixty and dropped back to zero.

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"*Arcturus,* this is Ngomo. As far as we can tell, the entire crew is dead. The atmosphere in here seems adequate. I've taken my helmet off and I can breathe all right. The lights still work, and the blowers are still moving the air around. The temperature feels a bit high, but I understand that's normal for the Khorilani. There are corpses all around. They seem to have dropped right at their stations. Here's Commander Chavez."

The voice of the Medical Officer came on. "Captain, I've looked over several of the dead crewmen. I don't see any marks on them, to indicate they died from physical injuries. My best guess is suicide, by the entire crew."

Likhatchov's voice replied: "Any signs of poison, or anything like that?"

"I don't even know what their normal expressions look like. I've no way of judging whether they exhibit poisoning symptoms."

"All right. At least there's no resistance. Ngomo, secure the ship and stand by to help the tugs. Then return to your ships."

"Yes, sir. Ngomo signing off."

Johnson switched to the intercom, planning to call Friedrichs, but found the captain already in consultation with the Intelligence Officer.

". . . Anything like this happening before?"

"Remember, Captain, during the whole course of the war we've captured only two enemy ships before this one. I imagine that's why Fleet Command was so eager to recover this one. According to the information I have in my files, the first one captured was holed in all compartments, and had completely lost atmosphere. So, of course, it was no surprise to find the entire crew dead. The second had some compartments still airtight, but had taken several hits in quick succession. It wasn't clear whether the screens were still operating right up to the end, so the crew may have been killed by radiation. However, I did find that one of the officers examining the ship immediately after she was captured suggested the possibility of mass suicide on the part of the crew."

"He evidently was right, then. We seem to have a clear-cut example of it in this case. All right, thanks." The intercom gave out some switching noises, then Likhatchov's voice came on again.

"Johnson, this is Likhatchov."

"I was listening, Captain. What is it?"

"We've taken an awful lot of time here, and apparently for no good purpose. What do you think of splitting the Division, leaving one Squadron here to guard this operation, while we take the other Squadron and start hooking up on that Cruiser right away?"

Johnson leaned back in his chair. In a gesture he was completely unconscious of, he pulled at his chin

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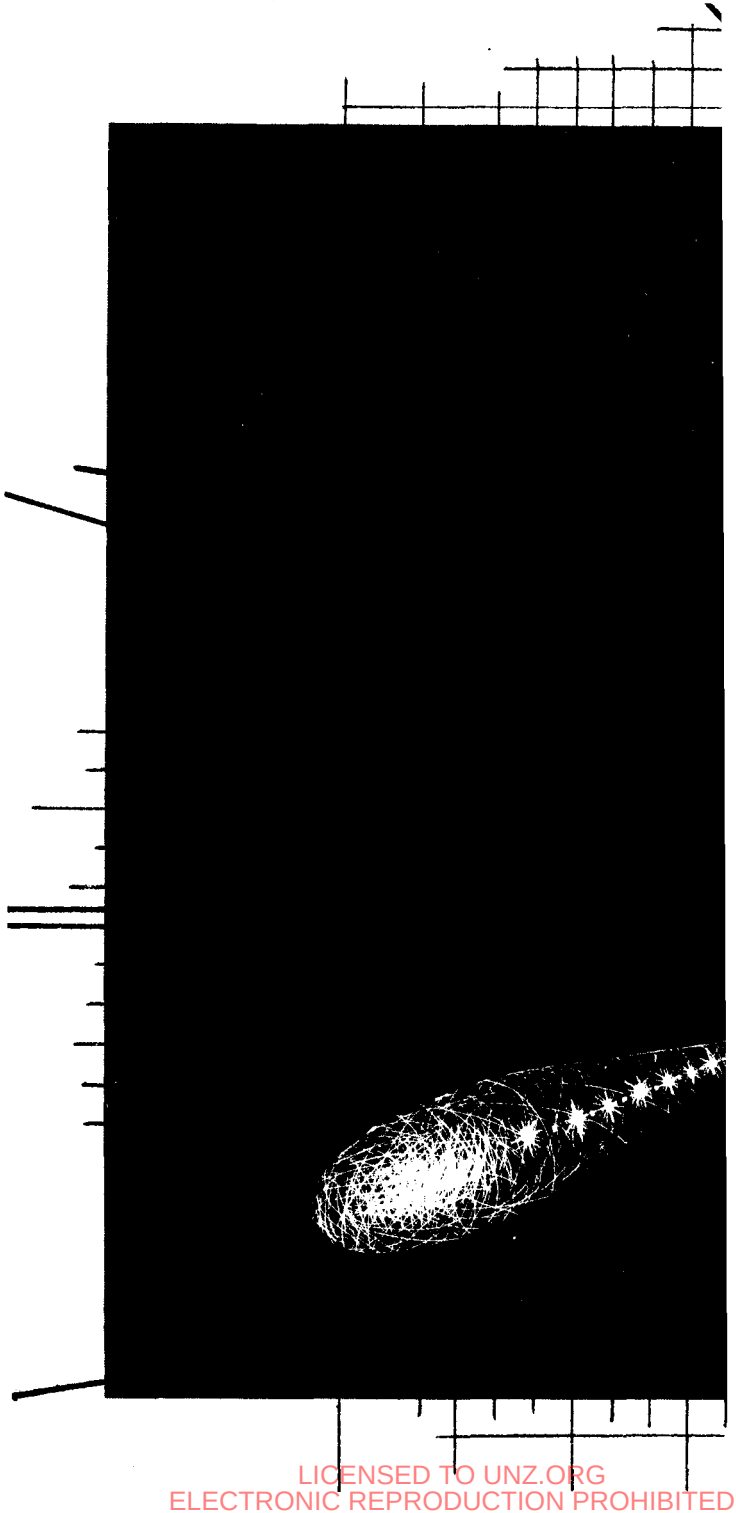

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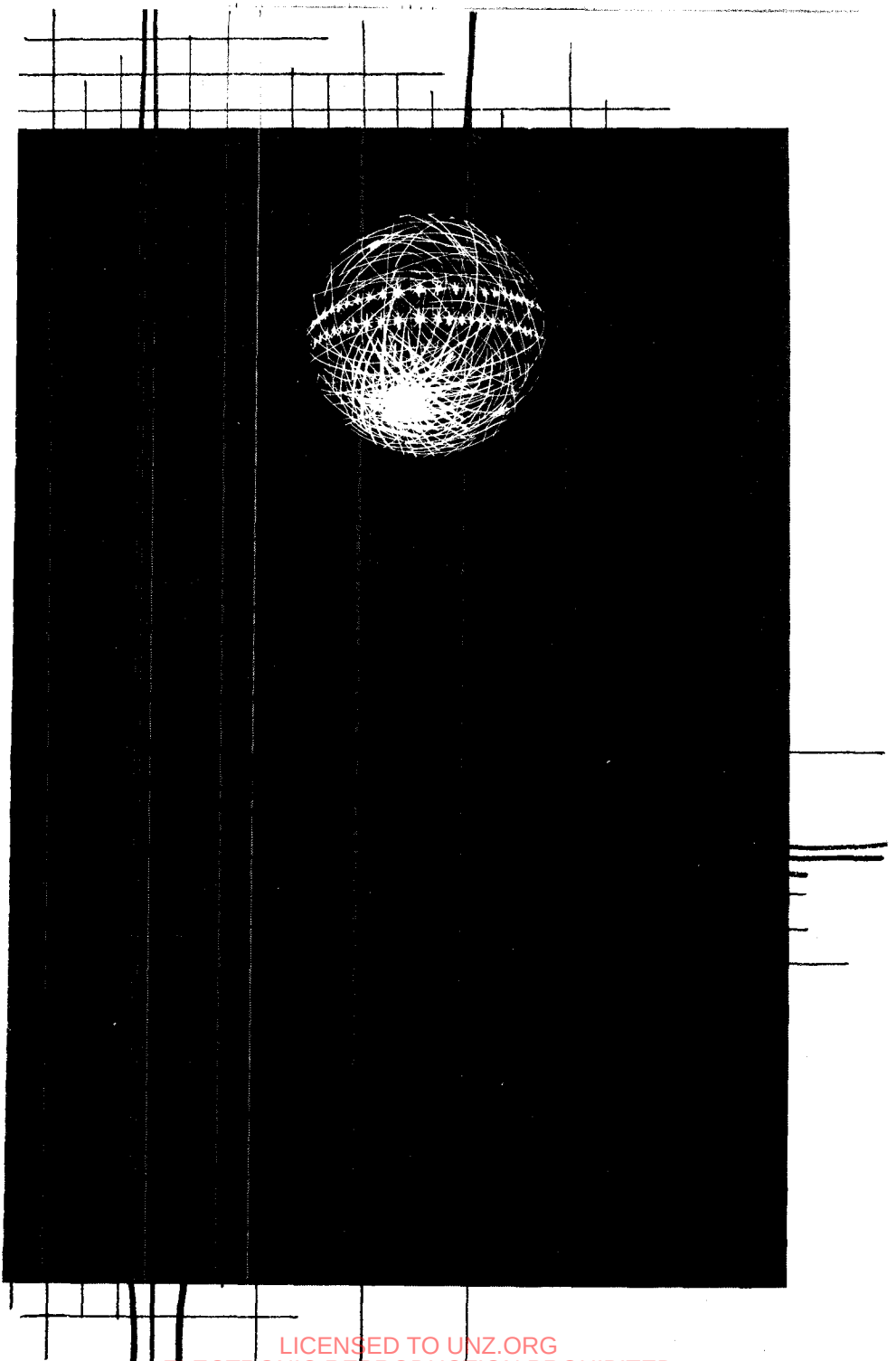

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with his thumb and forefinger. According to the Lanchester Square Law, splitting a force in half meant that each half had only one fourth the fighting power of the whole force. Because of this, Tactics Officers were drilled until it almost became a relfex, Never Split a Force. But there had to be exceptions, and the time saved here might be worth the risk.

Finally he spoke. "All right. As you know, splitting a force is usually considered a cardinal sin, but in this case I think it's justified. Our Destroyers are faster than any combat ships of the Khorilani, and either Squadron ought to be able to evade a decisive engagement until it can be reinforced. So in this case I think the risks are acceptable."

"Fine. We'll get under way as soon as the boarding party returns."

The Display was empty except for the one Squadron of Destroyers, surrounding the two tugs. Johnson stared at it until his eyes burned, waiting for the Cruiser they were heading for to come into view. After they reached the Cruiser, he would have enough to keep him busy. Until then he had nothing to do but wonder whether he had given Likhatchov the correct advice. He was too honest with himself to rationalize his way out. And besides, the problem might come up again some time, and he was more likely to make a good decision then if he were willing to admit he might have made a mistake this time. But he wouldn't know for sure until the operation was over successfully.

After a long time he glanced at the navigation repeaters, which duplicated the navigation instrument displays in the Pilot's compartment. They showed the Squadron to be nearly stopped. He looked at his Display again, and still saw no sign of the Cruiser.

He switched the intercom on. He heard Likhatchov's voice, evidently talking to the other ships' commanders. "My Pilot swears we're at the coordinates we were given. Does anyone see anything?"

There was silence, then a chorus of negative replies. "All right, then we'll have to begin a search pattern."

Johnson was back to work again. An efficient search pattern would have meant maximum spacing of the ships. However, this was the weakest defensive arrangement. Thus he had to devise a search pattern which balanced the need for a rapid, efficient search with the need for mutual protection among ships. The computer finally produced one which satisfied him, and the search started. The Squadron swept a larger and larger volume of space about the reported coordinates of the Cruiser. Fifteen minutes went by with no sign of anything except the usual specks of cosmic rubbish in interstellar space.

"I've got something," a voice reported. "Looks like debris from a ship. Not enough to be a Cruiser, though."

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"Go investigate it," Likhatchov ordered. "The rest of us will continue the search."

Minutes later, the same voice came back. "*Arcturus,* this is Hartman on the *Rigel.* We've matched course with the objects we spotted. They're not debris. They're human bodies. Thirty of them."

"Exactly the complement of a Cruiser," someone interjected.

"Abandon the search!" Likhatchov barked out. "Everyone converge on the *Rigel,* and set up a defensive formation."

Johnson decided the same formation he had planned to use to defend the tugs while they were hooking up to the Cruiser, would be suitable here. In short order the ships were in position, and he kept only about half his mind on the Display. With the other half he followed the conversation between the ships.

"This is Hartman speaking. We've brought one of the bodies aboard. He was a crewman on the *Pleiades,* according to the markings on his jumper."

"That's the ship we were looking for."

"How did he die?"

"My Medical Officer says he died of asphyxiation and explosive decompression. In short, being tossed into space without a suit."

"He was definitely alive when he was decompressed?"

"No question about it. The symptoms are unmistakable."

Another voice cut in. "Perhaps he was in a compartment that was holed during the battle."

"I doubt it," yet another voice replied. "It would take a mighty big hole to cause that rapid a loss of air."

Likhatchov's voice cut through the babel. "Any indications that the *Pleiades* blew up, or met some other disaster?"

Hartman's voice came back. "There is a small amount of debris here, sir, but not enough to be the remains of an explosion. Somehow or other the whole ship is gone."

"Well, bring the rest of the bodies aboard, and see if you learn any more from them. Wait, you haven't space for that many." There was a pause, then Likhatchov ordered three other ships to assist in recovering the bodies.

Johnson watched the ships shift their positions in his Display. Soon the four recovery ships were clustered together. He blew up the picture to maximum magnification, but was still unable to see the bodies. He returned the view to that of the whole formation, and continued to watch.

Hartman's voice, almost too agitated to be recognized, came on again. "Hartman to *Arcturus.* We just recovered a body that had a note on it. It was stuffed up under the man's jumper, just a corner showing."

"What does it say?"

"It says, 'We tried to surrender,

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but they're throwing us overboard'."

"That's all?"

"Yes, sir. Evidently he just had time to write it and conceal it before he was thrown overboard, too."

"Thrown overboard! Who . . . ?" someone demanded.

"The Khorilani, of course!" a reply came.

"The barbarians!" another voice added. "They'll neither take prisoners, nor allow themselves to be taken prisoner."

"Suicide before capture? It's fanatical. And they must have thought our men were cowards, who lacked the courage to do the honorable thing."

"All right!" Likhatchov barked. "Evidently the Khorilani reached this ship before we did. They must have wanted to make a capture as badly as we wanted to capture one of their ships. I should have anticipated something like that."

"No one could have anticipated this kind of barbarism!"

Another voice added, grimly, "At least now we know. You may as well die fighting, because you'll certainly die if you surrender."

"That's enough," Likhatchov cut in again. "As soon as those bodies are recovered, we've got to rejoin forces with the other squadron. We don't want either half of the Division to be caught by a Khorilani force."

"Then back to the base at System C182? That's going to be a long five days."

"It won't be five days," Likhatchov responded. "Just before we reached this spot, I received new orders. We're to proceed to System C473. It's only a day's travel at tug speeds."

One of the ship commanders, who must have kept a star chart handy, came right back. "But that's an enemy-held system."

"It was enemy-held. It was brought under attack about a week ago, and was supposed to be taken in not less than six weeks. But apparently we captured it in less than one week. Anyway, we've been ordered there."

Commander Johnson leaned back in the chair, and bounced experimentally a couple of times. "Say, these chairs feel pretty comfortable. Maybe we ought to import them from the Khorilani after the war is over."

Commander Ivanov, seated behind the strangely-proportioned desk, smiled ruefully. "That's what everyone says the first time they sit in one. Wait until you've been sitting in it a half hour or so. The Khorilani body structure is somewhat different from ours, and that chair was designed to fit them. It has lots of padding, but you'll soon find it's in the wrong places."

Johnson shifted his weight back and forth. "Hm-m-m, you're right, Yuri. I see what you mean. Some of the chair framework would bear right on human bones. Their musculature is obviously different from

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ours. The padding's in different places."

Yuri's face resumed its normal solemn look. "That's it. And this desk doesn't quite fit me, either. The drawers are just too widely spaced, and all the proportions are wrong. I'll sure be glad when we get some of our own furniture. It's not due for two months, though. That's when we expected to be occupying the planet."

"I guess an unexpected victory can be just as bad for the logistics people as an unexpected defeat. So the whole planet committed suicide, then?"

"That's right. This whole campaign was one of the most fantastic things I ever experienced. We came in with a force much bigger than the fleet they had defending the planet. We could crush their fleet if it stood and fought, or cut it to pieces if it ran. They tried to fight us off, and we did crush them. We were prepared to put aground a landing force of half a million men. We expected that the first wave would suffer fifty percent losses fighting its way down. But when we started the landing, the first wave got down without opposition. They set up their perimeters, still unopposed. We sent the second and third waves down, then held back the rest. Because there weren't any combat casualties, we had more men on the planet's surface than we were prepared to feed the second day.

"To make a long story short, then, they found that everyone on the whole planet had committed suicide. We've got something like ten million corpses lying around. Our Engineer forces have been working day and night to get them buried before we have a pestilence. I'm not complaining, of course. I put a lot of work into the plans for the landing. But I'm glad we didn't take the fifty thousand casualties we expected."

Johnson looked more closely at his friend. His close-cropped black hair and black eyes combined to give him a gloomy appearance. But now the eyes looked tired, and his face was lined. "You look like you've been putting in a lot of overtime, Yuri. How come?"

Ivanov passed a hand across his face and sighed. "I certainly have. I put in at least twelve hours straight here in the office, and usually come back for more after supper. The only break in that routine is when I have to make a field visit somewhere on the planet."

"What have you been doing? Normally a Tactics Officer doesn't have anything to do once the fighting is over."

"That's usually true, yes. But I've been working with the Intelligence people, trying to make sense of this planet we captured. General Hamaguchi is under a lot of pressure to extract every bit of information he can from this planet, as rapidly as possible. His Intelligence staff has plenty of experts on military and industrial matters, but he's short of economists. So every Tactics Officer

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the Fleet could spare, as well as most of the Army's Tactics Officers, are working trying to figure out the organization of the enemy economy here."

"Have you got anywhere yet?"

"Hardly. We've been working at it less than a week. We're just beginning to understand what they were doing here. In fact, the chairs like that one you're sitting in convinced us our first theory about the planet was wrong."

"What was that?"

"At first, we thought the planet was a penal colony. But after a couple of days, we decided they wouldn't have bothered to ship in millions of comfortable chairs like that to a penal colony. But we still don't believe it was a normal colony."

"But whatever made you think it was a penal colony? And why do you feel the comfortable chairs rule that out? Maybe it was a colony for political prisoners. Historically on Terra, they were given better treatment than that given to criminals."

"Well, our original reasons just weren't consistent with the notion of comfortable furniture. Listen. I'm supposed to visit a plant site, about an hour's trip away from here. Want to come along? I can show you some of these things easier than I can explain them."

Johnson glanced at his watch. "You bet. I wouldn't miss the chance to get a look at the planet. Will we be back before evening? If not, I've got to get a message to Commander Chavez, from my ship."

"Yes, we'll be back before then. After supper tonight, I've got to present my findings about the plant site to the rest of my team."

"Fine. Chavez and I usually go pub crawling together when we're on ground leave. There aren't any pubs here, but we figured we'd eat together tonight. Care to join us?"

"Wish I could, but I'll probably have a sandwich here in the office while I get my findings in shape for the rest of the team." He got up from the desk, put his hat on, and headed for the door. "My flier's up on the roof. Is this Chavez your captain?"

"No, he's the ship's Medical Officer."

"That sounds like an unusual combination, a Medical Officer and a Tactics Officer."

"Not when you stop to think that he's the only other man on the ship with a scientific outlook. We seem to have similar personalities to start with, and we're pretty much thrown together because our interests are so different from the rest of the crew."

"I know what you mean. Twice I've served with captains who had been Tactics Officers, but most of the time I've served with people who came up through Gunnery or Engineering. Sometimes it gets pretty grim, trying to find something to say when you're off duty, other than trivia and small talk. Here, this one's my flier. Hop in."

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Moments later they were aloft and hovering to one side of the spaceport. Johnson could see the *Arcturus* off to one side, surrounded by scaffolding around the damaged compartments. There were a number of ships scattered around the spaceport, most of them also undergoing repairs. He also could see the wreckage of two Khorilani ships, both evidently freighters which had been caught on the ground during the fighting.

"Look over there," Ivanov pointed. "See those warehouses?"

"The burned ones?"

"Yes. They're typical of the Khorilani industrial installations. They tried to destroy everything, but didn't do too well at it. They set fire to those warehouses, but since they held nothing but metal ingots and semi-finished products such as plate, strip, and beams, the burning didn't hurt things much."

They gained more altitude, and swung away from the spaceport. "This whole area is typical of their installations," Ivanov went on. "This was the spaceport. They had some repair and refitting facilities for their ships, the warehouses for holding cargo in and outbound, and a landing area for fliers. Over there"—he pointed to one side of their line of flight—"they had huge blocks of apartments. They're far enough away from the spaceport that the noise level is low. There will be some apartments just like those, at the plant we're going to. You can see them when we get there. And beyond the apartments, there were fields under cultivation. The whole setup seems to be carefully integrated. All at one site, they have some industrial activity, housing for the workers, and food production and processing."

They flew on, covering kilometer after kilometer of forests, rivers and savannas. Occasionally they passed near one of the Khorilani settlements, each one showing the integrated pattern of industry, housing and agriculture. There were no roads, however. Evidently the Khorilani depended exclusively on antigravity fliers for transportation.

"This certainly is a pleasant world, at least at this latitude and during this season," Johnson remarked.

"Yes, it reminds me of home. Back on Schastye we have big stretches of uninhabited country, like this."

"Well, it sure doesn't remind me of Terra. That human antheap is just crawling everywhere with people. Even our forests and parklands are crowded with people year-around."

"Well, of course, we have only about forty million people. That's a far cry from the ten billion on Terra."

A few minutes later, another industrial cluster appeared on the horizon. Ivanov nodded his head toward it. "That's where we're going. There's a mine there, a refining plant, and the usual apartments and farms. You'll get a chance to look

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over the whole integrated complex."

Ivanov brought the flier down just outside the entrance of a large cubical building. "This is one of their apartment buildings. There are about five hundred apartments in here. There are several other similar buildings scattered out through a square kilometer or so."

They went in through the entrance. Ivanov led the way up a flight of stairs.

"This is my first visit to this site, but this apartment is identical with every one I've seen so far. From what the others have told me, every apartment building on the planet seems to have been built from the same blueprints."

When they reached the second floor, Ivanov opened the first door they came to. It revealed a small, square room with one window, a bed along the right-hand wall, one easy chair like the one Johnson had used in Ivanov's office, a desk and chair under the window, and a closet in the left-hand wall.

"Note that with the exception of the easy chair, every piece of furniture is built in. The bed, the desk, the closet, are all part of the building. Every one of these apartments is identical with this one, right down to the placement of the furniture."

Ivanov slid open the closet door. "Look at this clothing. It has a 'uniform' look about it. There seem to be just half a dozen different kinds of clothing, ranging from what is obviously a work uniform, to something for relaxing in, and some pajamas."

He slid the closet door shut, and went back to the door of the apartment. "Notice this door," he pointed at the knob. "There's no lock on it."

He stepped into the hallway, and pointed to another door. "That's a communal lavatory. Farther down the hall, there's a sort of lounging room. There're some more easy chairs, some tables, games, and so on."

"What kind of games do they play?"

"Let's go. You can see for yourself."

He led the way down the hall, and they soon came to a large room which opened off one side of the hallway. There was a large window, over which a thick curtain could be drawn. There were a number of couches and chairs, all evidently well padded. On one of the walls was a large circle, marked with several smaller concentric circles. On close examination, Johnson found it to be made of a spongy plastic, and the surface was covered with tiny pinholes.

"Looks like a dartboard."

"That's exactly what it is," Ivanov replied. He went to a door built into the wall, and pulled out a set of needle-pointed, finned objects. The proportions weren't quite right for human hands, but they were clearly darts. Johnson took one, stood back,

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and threw it at the dartboard. It hit about two thirds of the way out from the center, at the ten o'clock position.

"Watch the gravity here. It's a bit less than Terran standard, so your shots will go a bit high."

"It's not the gravity," Johnson replied. "I'm just out of practice. What else is in that cupboard? Any more games?"

"Yes, there are several games in here. They're all pretty much alike. This one is typical of all." Ivanov replaced the darts, and brought out a square board, about half a meter on edge, with a plastic hinge allowing it to be folded in half. It had a series of interconnected squares and circles on it, of various colors. He reached back in the cupboard, and brought out a small box. It contained half a dozen small plastic pyramids, identical in shape but each of a different color. There were also two regular dodecahedrons, with dots on their faces. Johnson examined the items closely.

"Obviously these pyramids are playing pieces, and these other two things are twelve-sided dice," Johnson said. He kept one of the dice, and handed the box back to Ivanov.

"That's the same conclusion our analysts came to. These pieces are to be moved around the board, after some set of rules, and in accordance with the fall of the dice. But so far as I know, no one's figured the game out yet. We've been too busy with other things." He put the board and the pieces back in the cupboard, and closed it. "I see you're a souvenir hunter, too."

"You mean this die?" Johnson said, as he tossed it up and caught it. "I might some day run into a Game Matrix where I need the odds I could get from a die like this one."

"I guess everyone in the occupation forces has picked up a souvenir or two. Eventually some enterprising soul will start selling them to people down here on ground leave. Well, we've got to hurry now. There's not much else to show you in this apartment building. There's a common dining room down on the first floor, as well as what looks like a library. As near as I can tell, all the books are of a technical nature. I can't read their language, but all the books I've looked at seem to be filled with mathematical tables, drawings of a scientific nature, pictures of machines, and things like that.

"This sameness of all the apartments, and the communal living, at first made us think this had been a penal colony. Ordinary colonists, we believed, would have been allowed more room for individuality. But we later decided that the people here couldn't be condemned criminals. There was too much obvious effort made to make things comfortable and pleasant. The soft chairs were one of the first things that pointed out the error in our first conclusion. But if you look at the apartments, in the context of people used to communal living, you can see a lot of other, more subtle, indications that

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they've tried to make things comfortable."

"Yes, I noticed that the outside of the building was nicely landscaped. Somehow it just doesn't strike me as being a prison."

"We came to the same conclusion, after a couple of days of looking around. Well, do you want to see any more of the apartments?"

"No, let's get on to the plant you're supposed to examine. Can I help you any? Or would it take longer to tell me what to do than I could save you by doing it?"

Ivanov led the way back to the stairs, and started descending. "Yes, you can help, since what I'm doing doesn't take any particular skill. We have to find out what this plant was producing, and get some estimate of production rate."

They stopped at the entrance to the apartment building. Ivanov pulled out a map, examined it, and pointed. "It's not just the landscaping that makes this place pleasant. The mine that provides the basis for this site is over on the other side of that hill, where it's invisible from here. And the refining plant is over there," he pointed again, "completely out of sight."

"They went to some effort, then, to give the workers pleasant surroundings."

"Yes, but even so they seemed to do things backwards. The people lived here because the mine was here, not because it was a nice place to live. And there were just enough people here to run the mine and the plant, and to grow food for the industrial workers. In our colonies, we concentrate the farming where the soil and weather are good, and ship food to the industrial towns."

"It reminds me of pictures I've seen in Terran history books," Johnson remarked, "of what used to be called 'company towns'. It has the same air about it."

"I've never heard the term before, but I get the idea. It seems a very apt description. Well, let's get going. We have to look over the plant and the mine yet, then get you back to the spaceport." He strode down the steps and toward his flier.

Commander Johnson glanced at his watch. Chavez was late. *What,* he wondered, *had the Medical Officer found to keep himself busy during the day?* He looked around the building which had been converted into an Officers Mess. Obviously it had once been one of the Khorilani apartment buildings. *That made sense,* he thought. The rooms were usable as quarters for transients, and the cafeteria could be converted to a human dining room without too much trouble. Certainly the plumbing and the stoves should be usable. The chairs and the tables might not be proportioned quite right for humans, but they would serve until human furniture could be shipped in. Only the automatic ordering and robot serving equipment would need to be installed, and undoubtedly that kind

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of equipment had been brought in by the first units of the occupation force.

He heard the door open, and turned just as Chavez entered. He saw that the Medical Officer was accompanied by another man, who also wore the insignia of a Medical Officer.

"Hi, Manny."

"Evening, Arnie. I'd like you to meet Kyril Svoboda. We went through medical school together. He's assigned to the Intelligence staff here. Kyril, this is Arnold Johnson. He's Tactics Officer on my ship."

They exchanged firm handclasps. "What are you doing on the Intelligence staff?" Johnson asked.

"It's just a temporary assignment. It amounts to doing medical research on the Khorilani. We want to learn as much as possible about their physical and chemical makeup."

"You can't do much with nothing but corpses to examine, can you?"

"Not a whole lot. And to make things worse, all the corpses are several days old before we get to them. Still, we're learning a lot about their anatomy and so on."

"I've spent the day with Kyril," Chavez interjected. "There's nothing to do on the ship, so when I heard he was here, I looked him up. He managed to keep me busy helping him."

"I really twisted your arm, didn't I?" Svoboda asked.

"You didn't have to. What scientist could resist the opportunity to examine an alien body. In a lot of ways, they're different from any intelligent life form we've ever dealt with before."

They entered the dining room, found an empty table, and sat down. Then they punched their orders on the menu board. While they were waiting for the robot servers, Johnson gave a brief account of his day.

"You really got a chance to see one of their manufacturing sites?" Svoboda asked. "I haven't had a chance to get away from this area since I landed. Been too busy here."

"Can't you justify a trip to examine some of the cadavers at the other sites?" Chavez asked.

"I'm afraid not. We've got our lab set up right here, and they bring in samples from all over the planet. Don't think I haven't thought of it. But I can't get away with it."

"How about trying to make an inspection tour of the local hospitals? Surely they had some."

"That's not a bad idea, except that the teams to examine the various hospitals have already been set up, and I'm not on them. I was given a different assignment."

Chavez leaned forward, suddenly showing interest. "Say, what about those hospital inspection teams? Do you think I could get in on one? It'll be at least five days before our ship is repaired, and I'd like to do something besides stick around this spaceport."

"Well, from what I've heard, you can learn just as much by examining

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their local hospital as you can by going to any of the others. It seems they follow the same pattern as they do with the living quarters. Every one of their complexes of industry and residential areas has one hospital, and they are all apparently built to the same plan."

"Even so, it might be worth spending some time looking the place over. I might be able to learn something useful from their medical techniques."

"That was the original idea in examining the hospitals, of course. But I've talked to some of the people examining the hospitals, and they seem pretty disappointed. Khorilani medical science is either very primitive, or else it's extremely sophisticated, far more than our own. In either case we don't seem to be able to learn much from it."

"I'm afraid I don't follow you."

"Well, they just don't seem to have any significant medical capability in their hospitals. Look at these various settlements. All of them involve heavy industry of some sort. There are just bound to be lots of your typical industrial accidents. You know, burns, broken arms and legs, crushed hands and feet, exposure to toxic chemicals, that sort of thing. But from their hospitals, you'd never know it."

"You mean no organ transplant capabilities, and so on?"

"Not only that, apparently they don't even give blood transfusions. Their surgical capability seems completely limited to minor restorative surgery, of the nature of removing someone's tonsils. It doesn't even look as though they're set up to amputate a leg."

"But what do they do with their industrial accident cases?"

"We just don't know. That's what I was saying. Either their medicine is so primitive they don't even treat them, or it's so sophisticated they cure a broken leg with a pill. I've been told they have well-stocked pharmacies, but we have no way of knowing what conditions the various drugs are used to treat. I understand the Intelligence people are making good progress in learning their written language. Once they get a translation computer programmed, maybe we can get some of their medical references translated. In the meantime, we can only speculate."

The serving robots brought their food, and conversation ceased temporarily. After a few minutes, however, Chavez spoke to Johnson.

"Say, you know that problem you're always wondering about? The business of why the Khorilani used such bad tactics?"

"Yes. I'm not the only one puzzled by it. I've had similar comments from several of the Tactics Officers I've talked to here."

"Well, there's another problem that seems to be bothering everyone here on the planet. This colony just doesn't make sense, either. Or it doesn't seem to, anyway. You men-

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tioned the economists trying to figure it out. Kyril here told me some of his thinking about it, and some of the results he's gotten."

"What kind of results."

"It's his story, so I'll let him tell it."

"I'd be very much interested in hearing about it. It's a relief to know we Tactics Officers aren't the only ones puzzled by the Khorilani."

Svoboda laid his fork down, and pulled at one ear lobe. "Well, I'm not sure I've made any progress in unraveling the mystery, but I've made some rather interesting discoveries.

"When I got here a week ago, there was still some support for the theory that this planet was a penal colony. The sameness of construction, and the austere living quarters, could be explained by viewing the entire planet as a giant prison. When it became apparent that living conditions weren't all that austere, the prison theory was dropped.

"But I looked at the sameness of construction from another standpoint. Consider that all the apartments seem to be single rooms, intended for use by only one person."

"I guess that's true, but so what?"

"It means that no provisions have been made for family groups."

"Perhaps their marriage customs are different from ours."

"Almost certainly they would be. But even so, there are no arrangements for couples living together, on either a temporary or permanent basis. And there are no provisions for children."

"Perhaps children are raised communally, in nurseries, or something. They seem to do everything else communally."

"It's possible, but none of the apartments have nurseries."

"That is strange. Surely they don't colonize with males only, then bring in their females after the colony is well established."

"That was my first reaction, too. A race capable of star travel must certainly be well beyond that kind of sexual chauvinism, that restricts the activities of one sex under the guise of protecting it.

"Well, to make a long story short, I concluded that since they didn't make any provisions for raising children, they must have been certain there wouldn't be any. Now the only way they could assure that is to colonize the planet with only one sex. And that's exactly what they did. It was hard for me to believe. Nevertheless, that's the way they did it. All the colonists are females."

"What? All females? Every last one of them?" Johnson burst out.

"And that's not all," Svoboda continued. "I haven't told you the most surprising part of the whole story. The race is oviparous. This is the first time in our history we've encountered an intelligent oviparous race. And finally, it wouldn't have mattered if there were any males on the planet, as far as having children is concerned. Every one of the colo-

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nists we have examined has been a nonfunctional female. Their ovaries are completely atrophied."

Johnson stared at Svoboda. His fork, completely forgotten, hung suspended halfway to his mouth. Finally he found enough of his voice to croak out, "Have you examined any of the bodies on that Khorilani ship we retrieved?"

"No, not yet, but they're all being stored in deepfreeze in the lab where I'm working."

"Could you examine them? Right now, I mean? Tonight?"

"Is it all that important? We'll get around to them eventually."

"It is important. It's absolutely vital. If they turn out to be nonfunctional females, too, then I believe I've got this whole puzzle solved."

Johnson looked around General Yamaguchi's Briefing Room. Like most such rooms, the walls were lined with charts bearing the most up-to-date information available on what the particular commander considered to be his most important problems. Johnson noted charts labeled "Hospital Man-Days This Month," "Men Absent or Missing," "Ships Awaiting Unloading." Evidently Yamaguchi's major concerns were administrative, rather than those of combat. These were the kinds of things which could get a commander in trouble with the Inspector General, with Parliamentary Investigating Committees, and with muckraking journalists. They were also the kinds of things that a combat commander hates to be bothered with. It must be galling for Yamaguchi, Johnson thought. He was known as a hard-driving, no-nonsense fighting man. He had undoubtedly expected that the conquest of this planet would add considerably to his reputation as a fighting general. Instead, it brought nothing but administrative headaches.

Chavez's voice jerked his attention away from the charts on the walls. "How are you feeling? You think you need another dose of stimulant?"

"No, thanks, Manny. You've got me so hopped up I'm about to jump out of my skin already."

"Without it you'd probably be asleep on the floor right now."

"That's true. Even in spite of your pep pills, my eyelids feel like they're covered with sandpaper."

"Well, you can't expect to go all night without any sleep, and not show any signs of it. I can give you stimulants to keep you going for a while, but there's nothing I can do to get the fatigue poisons out of your system. Eventually you're going to have to get some sleep, and the sooner the better."

"Maybe I can get some after this meeting. How are you doing?"

"I'll manage. I did get a couple of hours sleep, after Kyril and I finished the autopsies. It wasn't really enough; I still feel rotten, but it was better than nothing."

"Where is Kyril, by the way?"

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"He's coming. He called me just before I left my room. He was stopping by the Lab to pick up some pictures and other things in case we get some questions on the results of our medical examinations of the Khorilani corpses. Where's your friend Ivanov?"

"Right behind you," Yuri's voice sounded.

"Good morning, Yuri," Johnson said. "You look like I feel."

"You're not looking so good yourself. Did you get the computer runs?"

"Right here," he indicated a package under his arm. "I got the results of the final computations just in time to get over here."

"How do the results look?" Ivanov asked, but Johnson's answer was cut off by the arrival of General Yamaguchi's Chief of Staff, Colonel Hermannsfeldt. Immediately there was a bustle as the officers on Yamaguchi's staff, who had been standing around the room and talking casually, hastened to seat themselves. The most senior officers took chairs around the long table in the center of the room. Johnson and his friends took chairs against the wall, as inconspicuously as possible.

Hermannsfeldt looked a bit sleepy, too, Johnson thought. He had been outspokenly unhappy when Colonel Wilson, Ivanov's temporary boss, had awakened him in the small hours of the morning. Johnson suspected that Wilson had derived a certain relish from awakening Hermannsfeldt. It gave him a chance to work off the irritation he'd felt when Ivanov and Johnson had come pounding on his door at an hour well past midnight..

Both the abruptly awakened officers had had the same question. "Is it all that important? Can't it wait until morning?" But both had finally agreed it was important, important enough that the briefings scheduled for General Yamaguchi's morning staff meeting should be rearranged to include Johnson.

The clock on the wall showed a few seconds to go before the scheduled start of the meeting. Svoboda rushed into the room, clutching a large envelope to his chest, and scuttled over to where the other three were. He had just seated himself when General Yamaguchi entered the room. Johnson noted with approval that the general did not expect his staff to jump to attention when he entered the room. Senior officers who were that much impressed with the prerogatives of their rank tended, in Johnson's opinion, to give inadequate attention to the important problems. They used up all their energy on trivial matters.

As soon as the general had seated himself, Colonel Hermannsfeldt was on his feet, and starting the meeting. "General, before you hear the regularly scheduled briefings from each of the staff sections, we have a report from the group working on the problem of analyzing the economy

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of this planet while the Khorilani held it. The report is based on some newly discovered facts. Rather than try to summarize the report, I'll let Commander Johnson report on his work."

Johnson stood up. He strode to the lectern at the end of the room, thinking it would give him something to lean on. Unobtrusively, he rubbed his palms against his trousers, trying to dry them. *What's wrong with you,* he asked himself. *You've briefed four-star rank before, haven't you? And it never bothered you at all. This time it's different,* he answered himself. *Before I was always dealing in facts, not in a mass of sheer speculation.* He dropped the package of computer printout on the top of the lectern, gripped the lectern firmly with both hands, faced the general, and cleared his throat.

"Good morning, General. As Colonel Hermannsfeldt indicated, within the last few hours we have uncovered what we believe are some significant new facts about the Khorilani. Before going into detail on them, however, I'd like to give some background to put them in context. I know this is material you are already familiar with, so I'll try not to say anything more than is absolutely necessary."

"You already have," Yamaguchi growled, "but go on."

Johnson swallowed, then continued. "Yes, sir. To start with, there is the matter of the relative losses of the Khorilani forces and our own. By the use of Game Theory and so on, we can compute what our best tactics should be, what their best tactics should be, and the expected losses on both sides. As you probably know, their relative losses are almost always higher than we compute they should be."

"Yes, I know that. My Tactics Officers are always underestimating what the Khorilani losses will be. But I'm not interested in the details. Since I was a Cadet at the Academy, you Tactics Officers have been trying to teach me something about Game Theory. I still haven't learned anything."

Despite this unpromising start, Johnson went ahead. "There's just one point I'd like to make, General. In computing our tactics, we use what's known as Zero Sum Game Theory. This Theory assumes that the winnings of one side are equal to the losses of the other side. This is true of parlor games, such as chess or checkers. The Theory is perfectly adequate there.

"However, in combat, it's only an approximation. If the Khorilani lose a man, that doesn't add a man to our forces. Nevertheless, if we both lose the same number of men, it seems reasonable to call the outcome a draw. Therefore, we use the theory even though we know it's only an approximation.

"The point I want to make is that it's a good approximation only if two conditions are met. These are that both sides have to have the same set

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of values, and that the total losses on each side must be only a small portion of their total strength."

"All right, now what's that got to do with your alleged new discoveries?" Yamaguchi demanded.

"I'm just getting to that, sir. Again, however, I want to put the new discoveries in the proper context. The Khorilani settlement on this planet is certainly peculiar, by our standards. In fact, they didn't settle it, as we would use the term. There was no attempt to establish a colony with families, schools, and so on. It doesn't have an air of permanence, of viability, to it. Instead, it resembles the kind of settlement we might put on some airless world, where there were valuable mineral resources we wanted to exploit, but which we planned to abandon when the minerals were worked out. On a world as hospitable as this one, we would settle a permanent colony. We'd expect it to be self- supporting in a generation or so. It might export metals as a way of trading for the products of advanced industrial worlds, but our emphasis would be on the colony. Here the emphasis seems to be on the metal exporting, with the colony a means rather than an end in itself."

"Even if that's true, what of it? What significance does it have? I'm not interested in anthropological research, Commander."

Johnson could read clearly the note of impatience in Yamaguchi's voice. The promise of new information could hold him only so long. But if the new facts were presented baldly, their significance would be missed, just as the significance of many other isolated facts about this planet had been missed.

"It's not just a matter of anthropological curiosities, General. What I'm getting at has a very vital impact on the nature of the way we're fighting.

"I have no doubt that the next few things I'm going to tell you have all been reported to you, piecemeal, by your various staff elements. The point I'm getting at, however, is that these things form a pattern, a pattern which isn't obvious when you look at the pieces separately.

"Consider the uniformity of their apartments, and the fact that they don't have locks on their doors. They seem to have no books except for technical ones. For amusement they play games of pure skill, or games of pure chance, but never any games involving bluffing or concealed strategy. Now, who is the one person you can't steal from? Obviously, yourself. Likewise, who is the one person you can't play chess or poker against? Again, yourself. Nor does any novelist read his own works for entertainment. He already knows how they are going to come out."

Johnson could see the impatience building up on Yamaguchi's face. The general's next words would undoubtedly order Johnson to be seated and quit wasting the time of

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everyone in the room. Hastily he continued, trying to make his argument as convincing as possible.

"Now what does all this suggest? It suggests that we have been mistaken in dealing with the Khorilani as though they were separate individuals, like ourselves. Instead, they seem to be portions of a corporate entity, with only a slight degree of autonomy. They can't steal from each other, because they aren't really separate entities. They can't bluff each other, because they have only one consciousness, instead of individual minds as we have. If one of them were to compose a poem, the others would know of it immediately, and wouldn't need to read it.

"I know this seems like speculation, but we do have some new information to support it. Every one of the colonists on this planet was a nonfunctional female. Furthermore, the Khorilani reproduce by laying and hatching eggs, rather than bearing their young alive. Finally, the entire crew of a Khorilani spaceship, which was captured just a few days ago, also were nonfunctional females.

"The conclusion all this points to is that the nearest analogy to the Khorilani society, among Terran creatures, is the beehive. There we find a few males, with the reproductive function carried out by one female, and all the work done by nonfunctional females. The worker bees are essentially organic robots, with no individuality. In the Khorilani, the situation is even more extreme, with each of the workers being only an extension of a single common mind for the whole species."

"Do you mean to say," one of the colonels at the long table burst out, "that the people on this planet didn't really commit suicide? That when this racial mind you're talking about had no further use for them, it just . . . just . . . *turned them off?* Like so much excess machinery?"

"That's the way it looks to me," Johnson replied.

"That would explain their treatment of the humans they captured," another one broke in. "In fact, they probably wondered why we didn't turn our own people off when their capture was inevitable."

"It also explains their hospitals," someone else added. "Why go to a lot of expense curing a serious illness or injury? It's probably simpler to hatch another egg. They could even program the hatcheries on the basis of projected numbers of injuries, or expected incidence of disease."

"That's why they never rescue the crews of damaged ships—"

Suddenly it seemed that everyone was talking at once. All around the room, men were gesticulating wildly, trying to make themselves heard. Johnson could see the storm building up on Yamaguchi's face. Finally it broke.

"Quiet!" he ordered, at the top of his voice. In the silence that followed, he continued in a lower tone.

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"Just a minute here. Let's not get carried away by this cleverly woven pattern of speculation. There could be other explanations for the conditions on this planet. Suppose they were a race of telepaths. Then they wouldn't need to lock their doors. They couldn't plot chess strategy, either. Nor could they bluff at poker. And they wouldn't write novels. You don't need to postulate a racial mind, to explain just about everything we've seen."

Even as Johnson's heart sank, he had to admire the general. Yamaguchi certainly had earned his rank. Very few people could have come up with such a good alternate explanation on such short notice. He started to stall for time, while he tried to marshal some arguments which would convince the general. Before he could more than open his mouth, however, the general continued.

"Furthermore, Commander, there's a serious inconsistency in your theory. Suppose, as you claim, the Khorilani are not individuals, but just elements in a . . . what did you call it . . . corporate entity? Then they would have absolutely no regard for the individual, right? In combat, they would fight ferociously, without regard for their losses. They would accept any level of casualties, to inflict losses on us, right? But they don't fight that way. In fact, quite the contrary. When they do decide to fight, they are very clever and cautious. You're a native of Terra. Surely you know something about how my ancestors back there used to fight, before they became aware of the value of the individual human. If the Khorilani were as you claim, they ought to fight like the ancient Japanese. But they don't at all. How do you explain that?

Johnson suppressed a smile, as a feeling of triumph rose in him. First, because the general hadn't ordered him back to his seat, but gave him a chance to explain. Second, because the general couldn't have asked a better question if Johnson had written the script himself. "I'm glad you brought that point up, sir. It bears on what I want to say next.

"It's true that in a battle you lose lives. But what else do you lose? You also lose equipment, which costs money."

"Just like a Terran," Yamaguchi snorted. "Always thinking of war costs in terms of money."

Johnson squelched a momentary flame of anger, and went on. "But when lives are meaningless, General, what else is there to think about? Warships, for instance, represent a major capital investment for them, just as they do for us. To us, however, an individual is irreplaceable, so we concern ourselves more with people than with ships. To them an individual means no more than fingernail paring does to us. So I'm suggesting that their tactics are designed to give them the best possible exchange rate in economic value, rather than in lives."

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"How could they possibly do that? They have no idea of our manufacturing costs, anymore than we do of theirs. How could they even calculate relative losses?"

"It turns out to be fairly simple. It's a well-known fact that the cost of a warship is almost directly proportional to its mass. We know the mass of each of their ship classes, and I'm sure they know the masses of ours."

"All right, suppose they do. What difference does that make?"

"Just this, General." Johnson picked up the package of computer printout and held it up. "Last night I spent some time calculating the tactics they should be using, based on the knowledge that a Monitor has about three times the mass of a Destroyer. The tactics the Khorilani have been using since the beginning of the war are exactly those I calculated. In short, they are conducting their fighting so as to get the best possible exchange in terms of ship-mass, rather than in terms of individuals. That's why they have been so stubborn about using tactics that we consider less than optimum."

General Yamaguchi sat silently for a moment, a thoughtful look on his face. Finally he spoke. "Very well, Commander, you seem to have proven your case. I suppose this is a significant discovery. Now that we know why they use the tactics they do, can we alter ours so as to take advantage of theirs, and get an even better exchange ratio?"

The old fox knows a lot more about Game Theory than he lets on, Johnson thought to himself. Not enough, though, to anticipate what was coming next. Johnson still had a selling job to do.

"Let me ask, General, are you satisfied with the overall progress of the war?"

"Why, of course," Yamaguchi replied, a puzzled look on his face. "With the present exchange ratio, we're bound to win. It's only a matter of time. I'd just like to modify our tactics, to speed things up."

"Consider this, then. A Monitor has three times the mass, and four times the crew, of a Destroyer. We are willing to trade up to four Destroyers to kill a Monitor. If we do it with less than four, we consider we've come out ahead.

"Looking at it from the Khorilani standpoint, they're willing to trade a Monitor for at least three Destroyers. If they get more than three, they consider they've come out ahead.

"As long as the Fleetwide average exchange ratio is between three and four Destroyers lost for each Monitor destroyed, as it has been since the outbreak of the war, *both sides are convinced they are winning."*

He waved the computer printouts again. "And this is true, not just of the Monitor-Destroyer engagements, but of every other battle I was able to analyze last night. By our standards, we're winning. By their standards, they're winning."

"This is nonsense," Yamaguchi

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burst out. "How can both sides think they're winning? One side or the other must be losing, and pretty soon that side has got to realize it."

"You may remember, General," Johnson replied, "that I said Zero Sum Game Theory was a good approximation to combat only under certain conditions. One of those conditions is clearly violated here: both sides fail to share a common set of values. And as the war gets bigger, the discrepancy between theory and reality is going to get worse. As long as both sides stick to their theories, however, they will both be deceived into thinking they are winning. In the meantime, they'll be bleeding each other white. Both we and the Khorilani are going to exhaust ourselves while we're mutually deluded we're winning."

"Well, Commander, you're a Tactics expert," the general replied, a trace of asperity in his voice. "What can we do to change this situation? What solution do you propose?"

"The solution is outside my province, General. The only way we can alter the situation is with a radical improvement in weaponry. The R&D people will have to work that out."

"Are you trying to tell me that with our existing equipment there's nothing we can do? No changes in tactics, no new doctrine, nothing that will help?"

"That's right, General. New tactics, new doctrine, and so on, will make only minor changes. They won't be enough to really matter."

Yamaguchi slammed his palm down on the table. "Defeatism! That's nothing but rank defeatism! Commander, I'm surprised the Navy let you get as far as you have. I thought better of Naval officers than that."

He turned and pointed at a two-star general towards the far end of the table. "O'Brien! I'm sick of this defeatist attitude. Get your people together and figure out something that can convince the Khorilani they're losing."

O'Brien must be Yamaguchi's Chief Tactics Officer, Johnson decided. He saw the man's face go pale. Then O'Brien swallowed once, leaned forward, and began in a mild voice. "General, I haven't had the chance to look at the figures the commnader has worked out. But assuming his figures are correct, then I have to go along with the conclusions he's drawn from them. We simply can't convince the Khorilani they're losing, not according to their set of values. And no amount of heroism, or cleverness, or whatever, is going to change the mathematics of the situation." In contrast to the mildness of the opening sentence, this last was delivered in a tone of voice that seemed to say, "That's my opinion, General, and if you don't like it, you can have my stars with it. I'm not going to change it."

General Yamaguchi glared back for a long moment, then his face be-

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came impassive. Finally he spoke. "Thank you, General O'Brien, for your considered opinion." He turned back to Johnson. "And Commander, I apologize for my intemperate remarks." He then looked all around the table. "Is there nothing we can do? Has anyone any ideas?"

Johnson breathed deeply, and wiped the perspiration off his hands. He'd got past the big hurdle. General Yamaguchi was one of those rare people, a commander who could tolerate a "No" answer from his staff. He spoke again.

"Excuse me, General, but there is one thing we can do." The general's attention was now riveted on him. "We can admit that both we and the Khorilani made a horrible mistake in letting the situation degenerate into warfare, and try to make peace."

By contrast with Yamaguchi's earlier remarks, his reply was subdued. But it still had the rumble of thunder hidden in it. "That sounds fine, Commander. But I've spent a long lifetime fighting humanity's battles, against a lot of different enemies. One thing I've learned in that time is that it takes two to make peace. If the Khorilani don't want peace, we can have it only by surrendering.

"Didn't you see that briefing tape, the one showing the debate in Parliament about the pursuit of the war? It was mandatory for all Army personnel. I had assumed all you Navy people saw it, too."

"Yes, I did see it," Johnson replied, somewhat mystified. "It was mandatory for the Navy, too. They stopped our Division in space, and had us all view it."

"Well, do you remember what the Minister for Nonhuman Affairs said about the negotiations with the Khorilani? How they wouldn't offer any reasonable terms, and finally demanded all the disputed planets for themselves, except for a couple of uninhabitable ones? That shows nothing but contempt for us. How can we make peace with people like that?"

Something clicked in Johnson's mind. The words almost tumbled over one another as he spoke. "I'd completely forgotten that, General. Thanks for reminding me. That's the last brick. It completes the whole structure.

"One of those uninhabitable planets they offered us was a supergiant, like Jupiter. Are there any Terrans here?" He looked around the room. "Anyone from Mars? Venus? Titan? Anywhere in the Home System?" There was no response. Some of them looked around at their companions, but no one spoke. "No one at all, then," Johnson continued. "It's no wonder it didn't occur to you. It just now dawned on me, and I'm a native Terran.

"Look, a full thirty percent of the economy of the Home System is based on raw materials extracted from the atmosphere of Jupiter. Several hundred million people, throughout the System, make their

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living transporting, or processing, those materials from Jupiter. And we haven't even scratched the surface. There's an inexhaustible supply of the light elements there.

"And what did the Khorilani offer us? Another Jupiter. With an airless planet in the same system, where there'd be no trouble building factories to process the chemicals scooped from the atmosphere of the big planet. From their standpoint, that pair is probably worth more than all the rest of the disputed planets put together.

"I imagine they offered them as a last desperate measure; a gesture of conciliation. They probably decided that when those greedy Humans wouldn't accept that split of the disputed planets, there was no hope of dealing with them. The only answer was to fight for their rights, especially since their Tactics specialists were convinced they'd win."

The silence that followed remained unbroken for a seeming eternity. Finally General Yamaguchi spoke, to what was evidently the most junior colonel in the room.

"Recorder, do you have all this on tape?"

"Yes, sir. Every bit of it," came the reply.

"Fine. There's no point in trying to write up a report summarizing what the commander had to say. Just transmit a copy of the tape back to Headquarters on Terra immediately. That will constitute my formal report on our findings on this planet." He turned to Johnson. "Thank you, Commander, for a very informative presentation. Your work in figuring out this situation is very commendable. The whole human race owes you a lot." Then he turned to his staff, and spoke in a brisk voice.

"Now, let's assume that the diplomatic people are going to get peace negotiations started soon. I imagine they'll hand this planet back to the Khorilani, since they can rebuild their installations in fairly short order, while we'd have to start from scratch. If we're going to do that, we might just as well start on an empty world. So we can close down all our operations here, and get ready to evacuate the planet. We'll just have to keep our defenses up until we're ready to leave."

Johnson picked up his bundle of computer printouts and slipped out the door of the room. He saw that Chavez, Svoboda and Ivanov were right behind him.

"Sounds like Yamaguchi is trying to get rid of his administrative chores as fast as he can," Johnson remarked.

"I don't blame him," Svoboda replied. "In his shoes, I'd do the same thing."

Chavez came up from behind, and threw his arm across Johnson's shoulders. "Well, how does if feel to be a genuine savior of humanity?" he asked. "You've undoubtedly saved several hundred thousand lives, and no telling how many billions of Solars on both sides."

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"Right," Svoboda and Ivanov chorused. Ivanov continued, "You're probably the first Tactics Officer in history to be a hero. Usually the fighting men take the credit for victory, and give us the blame for defeat. But they can't deny you the credit for this one."

Johnson gave them all a bleary-eyed look. "Right now, I feel like death warmed over. I didn't get any sleep at all last night, and then I was pretty keyed up for this morning's briefing. All I can think of at the moment is that a bed, even a Khorilani one, is going to feel mighty good. After about twelve hours of sleep, maybe I'll enjoy being a hero."

"Oh, I'm sure you'll enjoy it," Svoboda said, with a gleam in his eye. "You'll be making speeches and appearances; you'll be wined and dined; every pipsqueak politician on a hundred worlds will want to shake hands with you, while the video cameras grind on. Being a hero is lots of fun."

Johnson groaned. "I'd better make that twenty-four hours' sleep. Manny, let me have some sleeping pills. I'd better get some rest while I can." ■

In Times To Come

Our next issue has a cover by Kelly Freas which presented a lovely problem in communication to the artist. How can you paint a real, genuine, bug-eyed monster, and make a couple of them look like a doctor-nurse medical team; Big Green Men, with more eyes than any six people ought to have; a poor helpless damsel in their fell clutches . . . and make it look friendly . . .

The cover is, of course, on Jim Schmitz's new Telzey story, "The Lion Game"—a two-part novel incidentally, for the benefit of Telzey's cheering section—in which Telzey starts out to play bait to mousetrap some mysterious trouble-makers. As the title suggests, it turns out that the game they sought were not *mice—Or nice, for that matter!*

A little rough on Telzey—but it makes a great yarn!

THE EDITOR

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F. PAUL WILSON

the man with the anteater

Anyone who keeps a pet anteater in a stringently limited society is obviously a crackpot. But some crackpots have highly methodical cracks in their pots . . .

Illustrated by Kelly Freas

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No discussion of galactic business, of course, would be complete without mention of Interstellar Business Advisers. Armed with the tried and true maxims of a free-market economy and a number of new and daring precepts for the conduct of business on an interstellar scale, IBA played an important part in shaping the course of trade in the galaxy.

The company was founded by one Joseph Finch, a man whose figure has taken on an almost mythical air in the annals of galactic trade. The most farfetched stories concern the period before the founding of IBA, when Finch was still a resident of Earth—

excerpt from "Galactic Business:
A History",
by Emmerz Fent

On a steamy summer morning, Joe and Andy, the anteater, stepped out into their backyard and surveyed their domain. Thirty-eight, slight of frame and a bit on the homely side, Joe Finch didn't exactly cut an heroic figure. But he was looked up to as a hero by many nonetheless. And there were, of course, many who thought of him as a stupid, eccentric, thick-headed, bull-headed reactionary. But they seemed to be in the minority.

You see, in a world that functions with the smoothness of a well-oiled machine, the man who insists on deciding when to shift his own gears becomes a hero of sorts. A man with few friends, who had yet to meet his wife, whose sister and brother-in-law, unable to cope with Earth any longer, were living as splinter colonists on a planet called Dasein II somewhere out in nowhere, Finch was a loner. And in a highly collectivized, planned and patented society, loners, if they can avoid being swallowed whole and digested, become heroes.

Finch was mentally running through his plan to manipulate Arthur Gordon, Chief Administrator of Earth. Gordon was either a social idealist or a power-monger—the two are not always easily distinguishable—and Finch knew from certain sources that Gordon was planning to manipulate *him.* The thing to do was to make Gordon show his hand before he was completely ready and the strike going on at the Finch House plant right now could be the perfect lever.

"Stay here, Andy," he told his pet. "And if you get hungry, help yourself." Andy scanned the dry, virtually grassless yard and trotted off in the direction of a promising mound with his huge, furry tail held straight out behind him and his agile tongue seemingly licking his snout in anticipation.

"Don't overdo it or you'll have to go back on *synthe-meat* and formic acid," Finch warned. Andy glanced over his shoulder and stuck out his tongue.

Finch went out front, started up an old transporter with the words

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Finch House printed on the sides and back, and drove off toward Pete Farnham's machine shop.

As the last of the new equipment was being loaded, Farnham turned to Finch, "You sure you want to go through with this, Joe?"

"Look, Pete," Finch said, wiping his forehead on his sleeve, "you designed this stuff so I'd be able to increase my output by about another half without increasing my overhead or labor costs."

Farnham looked annoyed. "I'm not talking about that. I'm talking about the union . . . it's on strike, remember? They're very unhappy about losing their overtime."

"If the union had its way," Finch growled, "I'd still be using Gutenberg presses."

"But it's against the law to cross a picket line! Why don't you just wait it out as usual or maybe bribe the union president? All hell's going to break loose if you go through with this."

Finch locked the back of the transporter with a solid *click*. "That might be just what I'm after. Besides, this is as good a time as any to challenge a rotten law. Gordon's been pushing things a bit too . . ." His voice trailed off as he saw Farnham climbing into the cab. "Where do you think you're going?"

"With you, of course," Farnham replied and hefted a length of pipe. "I spent a lot of time designing that equipment and the only way it'll ever get to prove itself is if you get to use it. Now let's get moving."

. . . the pickets/a truck in their midst/hey!/stop 'em!/get them!/Hold 'em/don't let 'em through/ stop 'em!/ Stomp 'em!/but chain and bricks and barricades and bodies give way/a face looms/flail at it./Someone fires a shot/miss!/The police arrive/made it!/The pickets are being held outside and the police will deal with you later . . .

Joe Finch watched the roiling crowds from atop the Earth Building. "You just can't figure people, Andy," he told the pet he had insisted on bringing with him. "They clamor for a law to be passed and then celebrate a man who breaks it."

"I believe you're oversimplifying the situation, Joe," said a voice behind him. Finch turned to see Arthur Gordon: big, graying, about sixty, the man on whose "invitation" he had come to the Earth Building. It was their first meeting and the Chief Administrator of Earth got things off on the wrong foot by calling him "Joe;" Finch believed first names were for personal friends only.

"Oh, how's that, *Arthur?*" he replied, noting the C.A.'s wince.

"Well, I mean . . . it seems you've become a symbol to them—"

(My, what a phony smile you have, Arthur Gordon, Finch observed privately.)

". . . a symbol of Individuality—"

(I'll bet he uses a capital "I" when he spells that word.)

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"And Individuality is something each of them feels he has lost."

(Whose fault is that?)

"I imagine that some of them, deep in their hearts, actually hate you for maintaining a quality they've lost."

(I can think of a few union roughnecks who won't have to go that deep.)

"As a matter of fact—"

"Get to the point!" Finch finally interrupted. "Why did you 'invite' me here rather than have me arrested for breaking the picket law?"

Gordon's fixed smile was replaced by one of a more genuine nature. "O.K., Mr. Finch, I *will* be more to the point, although what I've been saying isn't far from it. Let's go into my office."

It was not until Finch was seated across the desk from him in the Chief Administrator's spacious main office that Gordon began to speak.

"Mr. Finch, the reason I did not have you arrested is very simple: you are the only man on this planet who can be described as a hero."

"I think you've got the wrong definition of a hero in mind, Mr. C.A. I'm not a hero . . . I've never done an heroic thing in my life. I may stand out in a crowd, but otherwise I think you're overestimating me."

Gordon frowned. "I don't think I overestimate you at all. The public is hungry for an idol and you, unwilling as you may be, are the prime candidate. In fact your unwillingness to cooperate with the idol-seekers only increases your popularity. To them you're the last of a rare species. Just look at you! You wander around with an antbear at your heels, you're making a pile of money in an industry that should have been extinct shortly after the development of *telestories*, you had a shyster lawyer wheedle a private home for you so you could raise ants for that ridiculous pet of yours and now you've taken to busting picket lines!"

"Nobody keeps me out of my own business!" Finch stated flatly and finally.

"I wonder about that," Gordon mused. "This is hardly the first strike at your plant . . . you've bargained with the union before, why did you choose to defy it this time? Planning to challenge the Picket Law?"

"Would it do me any good to try?" Finch replied in a noncommittal tone.

"Maybe. I never liked the law . . . didn't like it when it was passed and I like it even less at the moment."

Finch cracked his knuckles. "The Picket Law is a natural consequence of legalizing the picket line. You see, a picket line makes it possible to kidney-punch anyone trying to enter the building currently 'under siege' and sooner or later you don't cross a picket line if you know what's good for you. Then, with typical political logic, crossing a picket line was declared illegal 'in order to prevent violence during strikes.' "

Gordon snorted. "I've heard all this before, Mr. Finch. And I didn't

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ask you here to reprimand your extralegal activities nor to discuss the Picket Law with you. Instead of having you arrested, I'd rather make a deal."

"I had a feeling you'd find some use for me."

The C.A. ignored the remark. "Look, Finch, here's the situation: we've become an incredibly complex society here on Earth; the average man feels like a cog, feels a loss of worth. Oh, I know it sounds very trite but unfortunately it's very true. We've been warned about this for centuries but it's something that's almost impossible to prevent, even when you can see it coming.

"You, however, have somehow overcome it all. You've bucked convention, legal restrictions . . . even technology! You've become a symbol of the Individuality people instinctively feel they've lost and want desperately to regain. And I've found a way to give it to them!"

Finch smirked. "How? Pills?"

Gordon was not in a light mood. "No, the plan's a little more complicated than that. It's a daring plan and will frighten people at first; they'll want the end but they'll balk at the means. Unless—"

"Unless what?"

"Unless someone they admire not only endorses it but actively promotes it."

Finch shook his head as if to clear it. "Wait a minute. Let's just go back a bit. You're building up to the means and I don't even know what the end really is supposed to be."

Gordon strode to a bookshelf and pulled out a huge volume. "Ever hear of Gregor Black?" he asked as he laid the book on the desk."

"Some sort of technosociologist, wasn't he?" Finch replied. "But I believe his disciples are calling him 'Noah' Black now."

"Right. His theory was that both the individual and society are best served when the individual is doing the job for which he is best suited . . . the old 'right man for the right job' maxim. He figured that not only would you achieve maximum productivity but you'd also allow the individual the personal satisfaction and sense of fulfillment that comes from doing what he can do best."

"Where is he now?" Finch asked.

Gordon had opened the volume and was flipping through the pages. "Oh, somewhere in the Ninth Quadrant, I believe."

Finch snapped his fingers. "That's right! His group was outlawed so they decided to apply for a 'splinter colony.' "

"Ninety years ago," Gordon confirmed, "they took up the government's offer to any large enough group that wanted to settle an Earth-class planet and got free, one-way transportation to the prospective utopia of their choice. Since they were registered as a splinter colony, the planet was then declared off limits to all government traffic and Black and company could do whatever they wanted with it."

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"I'd love to know who dreamed up the splinter colony idea," Finch said with a smile and a shake of the head. "It's probably one of the few deals in history in which everybody gets what he wants: the government not only colonizes world after world, but it gets rid of all the local dissidents to boot. And the dissidents get their own world on which to live the way they wish."

Gordon was not listening, however. Pointing to the book on his desk, he said, "Here's the reason Black's group was outlawed: the Assessor."

"I remember the name," Finch remarked. "Gregor Black's miracle machine."

"Don't be too light with the Assessor . . . nor with old Gregor. He designed quite a machine. With the Assessor screening a population you wouldn't have, say, a potential physicist or chemist doing menial labor because his talents and abilities were never discovered and never developed. Nor would you have incompetents in important positions because of 'connections.' It's too bad the Assessor jumbled the minds of a few of his followers during testing . . . that's why its use was outlawed."

"Jumbled, hell!" Finch snorted. "It turned a few of his faithful followers into vegetables!"

"Well, you've got to remember that 'electrohypnosis'—which was the term for mind-probing in those days—was still in the experimental stages. Its use was integral to the Assessor but its control had not yet been perfected. Thus, the tragic accidents."

Finch yawned. "Just as well . . . never would have worked anyway."

Gordon smiled and leaned over his desk. "Oh, but it has!" he exclaimed softly.

"You mean you've heard from Black's splinter colony? I wouldn't put too much faith in . . ."

"No, no," the C.A. interrupted, "it has worked right here on Earth!"

"Where?"

"The Rigrod Peninsula."

"So that's what all the secrecy's been about out there," mused Finch.

Gordon was enthused now: "We started a colony out there twenty-six years ago using a thousand deserted children, each about a year old. Each was 'assessed' once a year for the first twenty years and education was modified and directed for each in accordance with the Assessor's findings; we were thus able to give them twenty years of education in roughly fifteen. Six years ago they were all given the option of either going into their assigned fields or returning to the mainland."

He paused dramatically. "All stayed."

Finch affected a surprised expression. He had a few contacts in the government and knew all about the Rigrod experiment.

"And the advances in technology, the arts, the life sciences, business

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and hundreds of other fields in these past six years have been incredible!"

"I can see how it would work," Finch said, "but why tell me about it?"

"Because it's going to take a massive selling job to get the public to accept it and my advisers think that endorsements by popular personalities would be the best technique. You, Joe Finch, are going to help convince the public that the Assessor is the greatest thing ever to come along."

"Oh, really? Not without a little more than a spiel from you, I'm afraid."

Gordon sobered. "What do you mean?"

"I mean I want to see Rigrod and see exactly what it's like. If this Assessor can do all you say it can, then I'll back you on it. But I want to see for myself."

"I'm afraid not," the C.A. frowned. "We've allowed free access of outside information into Rigrod but all outsiders have been barred. We can make no exceptions."

"Better make one this time."

"Need I remind you, Mr. Finch, that your situation in regard to the law at the moment is quite precarious?"

"I endorse nothing sight unseen," Finch stated. He was gambling now, gambling that the Finch endorsement was important enough to the C.A. to make him back down. "And besides, you've said nothing about my legal situation *after* I endorse the Assessor . . . how will I stand then?" As they say: if you're going to bluff, don't do it halfheartedly.

Gordon studied Finch with narrowed eyes and nodded slowly. "All right. All right, damnit! I'll publicly denounce the Picket Law and have the charges dropped after we go to Rigrod."

"Well, Andy," Finch said, scratching his pet's snout, "looks like we're going on a trip soon . . . and at government expense, no less."

The Rigrod Peninsula had been turned into a minor city, a tiny nation of a thousand. Order and symmetry ruled its design and new structures of unique conceptualization were on the rise. The inhabitants came out in force to meet Joe Finch. They were only physically isolated here and the figure of the crusty individualist with his ever-present antbear companion was immediately recognized.

He wandered through the crowd of residents commenting on this and that, answering questions and shaking proffered hands. He was impressed. These people were friendly, articulate and every one a specialist in his or her field. But there was a subtle undercurrent here, an undercurrent he had been sure he would find.

After the tour, Gordon and Finch retired to the C.A.'s Rigrod offices. Finch was skimming through a manuscript he had found on the desk. It was called "Interstellar Busi-

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ness: A Theory," by Peter J. Paxton.

"This Paxton is good," he told the beaming Gordon. "His logistical concepts will revolutionize interstellar trade. Does he need a publisher?"

"Sorry, Joe," Gordon laughed, "but Rigrod is setting up its own publishing house—and it will be a *telestories* format." He was needling Finch and enjoying it.

Changing the subject, he asked, "Well, now that you've seen our little project, what do you think of it?"

Now the touchy part: to stall for time. "I don't know. There's something about this setup that bothers me."

"What could bother you about it? It's the perfect society! Utopia!"

"The whole idea of utopia makes me more than a little nervous," Finch replied. "Can you give me a week or two to think on it?"

"I'll give you a week, Finch. That should give you plenty of time to assimilate what you've seen here today. But remember, those charges still stand."

"Yes, I'm aware of that. But don't you think the endorsement would hold more weight if it wasn't so obviously apparent that we had made a deal?"

"You have a point," the C.A. admitted and paused, thinking. "Why don't we try this: I'll get the charges dropped if you give me a tentative affirmation."

"O.K., Mr. Gordon. It's a deal."

And the Chief Administrator of Earth made good his promise the very next day.

When Gordon and two other men burst into the Finch backyard, they found that he was not alone. Andy was there and so was a young, fair-haired man in his mid-twenties. Gordon instantly recognized him.

"Paxton! It figures I'd find you here! Go inside. I've something to discuss with Mr. Finch!" The young man was quite cowed by the wrathful C.A. He looked to Finch and Finch nodded toward the door.

"Do as he says. He brought a couple of his bully-boys along so we'd better humor him."

When Paxton had disappeared into the house, Finch turned to Gordon. "Now what the hell is all this about?"

"You're under arrest, Finch!" Gordon roared.

"What for?" Andy raised his head and wondered who was making all this noise on such a pleasant afternoon.

"You know very well what for, Finch . . . for destroying a government project!"

"You mean the Rigrod experiment?"

"Yes! The Rigrod experiment! The whole structure of the Assessor-built society started to break down soon after your visit. You did something out there. I'm going to find out what it was. I don't care how popular you are, you're going to tell me."

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"I'll tell you what I did," said Finch. "I visited the place. That's all. You were with me all the time."

"You pulled something—" Gordon began.

"Damn right I did," Finch interrupted with a snort. "I destroyed that project willfully and with malice aforethought. And I did you a favor by doing it. It was bound to happen sooner or later, you fool! You thought you were creating the perfect society by basing it on human individuality, by making the best use of individual abilities. You took care of *individuality* . . . fine! But you forgot all about *individualism!*

"It never occurred to you that many people wouldn't be happy doing 'what they can do best.' As a matter of fact, many people don't give a damn about what they can do best. They're more interested in doing what they *like* to do, what they *want* to do. There might be a musician playing at the music center tonight who could be a brilliant physicist if he wanted to be, but he likes music instead. In an Assessor built society, however, he'd be working with mathematical formulae instead of chord progressions. He'd sit around envying musicians for just so long and then he'd either rebel or go mad. When are people like you going to learn that utopia is a fool's game?"

Gordon was in a cold rage. The project, which was to be a monument to his name, was being torn to shreds by this man in front of him. He spoke through clenched teeth: "But why didn't they rebel before you showed up? The project was working perfectly until then."

"You've had no trouble on the peninsula until now," Finch explained, "because you've been working with a biased sample. Those kids have been told all their lives that they are pioneers, that they'll be the ones to prove that man can have utopia. And so all the square pegs in the round holes—the equivalents of our hypothetical musician-physicist—keep mum on the hope that their discontent will pass . . . they don't want to destroy 'man's chance at utopia' by a hasty decision. And in keeping mum they never find out that there are others like themselves.

"Then Joe Finch comes along. And I'm not a hero, Gordon . . . I'm a crackpot, an eccentric, a nut. I've known about Rigrod for over a decade, now, and spent that time building up a reputation as a rugged individualist. Many times I felt foolish but the press and the vid played right into my hands. I've been a walking publicity stunt for the last ten years. That's why my pet is an antbear instead of a dog—although I wouldn't trade Andy for anything now. I've been hoping for a chance to get to Rigrod and you gave it to me. And that was all I needed.

"Allowing someone with a reputation as a crackpot individualist to wander through the Rigrod Peninsula is like introducing a seed crystal to a super-saturated solution: all the

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underlying threads of doubt and discontent start to crystallize. But don't blame me! Blame yourself and your inane theories and ambitions! You were a fool to be taken in by Black's theory, you were a fool to bring me to the project and you were a fool to think that I'd have anything at all to do with such a plan!"

Gordon finally exploded. "Arrest him!" he told the two guards who had been standing idly by.

The guards, of course, did not know anything about antbears. The antbear has been long used in the areas to which it is indigenous as a watchdog. Its forelimbs have monstrous claws which it uses for digging into termite hills but it can rear up on its hind legs and use these claws for defense. And the antbear has an uncanny ability to roar like a lion.

The two guards were quickly made aware of these facts. Andy startled them with a roar as they made their first move toward Finch. A few swipes with his claws and the guards were down and gashed and bleeding.

Andy stood beside Finch and huffed warily as his master scratched his snout. Finch turned to the livid Chief Administrator.

"Now get out of here and take your friends with you."

"All right, Finch. You've won for now. But let me warn you that your life here on Earth from now on will be hell! And don't get any ideas about getting off-planet . . . you're staying right here!"

But Joe Finch had been far ahead of the C.A. He had already sold his house, a printing firm had bought his machinery and all the properties of Finch House had been picked up by a *telestories* outfit. A handsome bribe had reserved two seats and one animal passage out from Earth on a moment's notice and Joe Finch, Peter J. Paxton and Andy were well into primary warp toward Ragna before Arthur Gordon had any idea they had left Earth.

With Finch's money and organizational experience and Paxton's business theories, Interstellar Business Advisers was born and grew with the expanding Federation. And Joe, at long last able to put aside his role of superindividualist, found a woman who loved him—and anteaters, too—and it wasn't too long before Joe junior came along. But that's another story. ■

The Analytical Laboratory April 1971

PLACE	TITLE	AUTHOR	POINTS
1.	The World Menders (Conclusion)	*Lloyd Biggle, Jr.*	1.34
2.	The Unreachable Stars	*Stanley Schmidt*	2.37
3.	Heart's Desire and Other Simple Wants	*W. Macfarlane*	2.86
4.	Higher Centers	*F. Paul Wilson*	3.38

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For nearly a dozen years I've been trying to get an article on the remarkable educational game invented at MIT. It's a great game, involving genuine skill in solving velocity and angular relation problems—but I'm afraid it will never be widely popular. The playing "board" costs about a quarter of a megabuck! **by ALBERT W. KUHFELD**

spacewar

Fletcher sat warily at his controls as the glowing blips approached each other in the battle display. His thoughts were divided; half his mind was thinking of the duel, and the other half was integrating out approach vectors. Trajectories meeting at forty-five degrees—Tatge would reach the point of intersection first, barely—the other ship was rotating into firing position . . . NOW! He punched down the firing button and shot off a full salvo of four torpedoes. QUICK! He slammed his controls left and forwards into an escape curve, cursing all the while. So *much* computing power available, and all wasted computing orbits instead of going into the fire-control loop! Well, those were the rules, and a duel wouldn't mean much if it were between his computer and Tatge's . . .

On the screen his second torpedo merged with Tatge's ship, and the blip spread into an expanding circle of sparkles. Tatge had got off only one torpedo, and it was going to miss. He was beginning to sigh premature relief as his inertia carried him forward into the explosion. His rockets weren't strong enough to turn him in time—he'd fired when he was too close. As the outer fringes of the debris touched Fletcher's ship, another fiery circle blossomed. Deadlock.

He turned to Tatge. "I'm getting sick of this; that's the third time in a row. Let's have the score, I want to see how we're doing."

Tatge punched several buttons on the computer console, and the printout chattered briefly. "You're still ahead, Ken, 35 to 29, but there are *43* ties now. You're shooting too close."

"I know, I know. Start 'er up again, I want to try something new."

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Two ships appeared on the display and began jockeying into Solar orbit . . .

Analog science fiction? Nope—digital science *fact.* That little scene has been repeated many times over during the last decade, with different players and varying rules of war. The two were playing a computerized battle game called "Spacewar," a game which has been implemented in many computer centers and which some of you may have seen on television on "The 21st Century." It's a fascinating game, perhaps the first true game of the space age, and its biggest drawback is that even the most minimal versions need something like twenty kilobucks worth of computer and associated equipment. Very few individuals have that much computer handy, so Spacewar is usually played "bootleg" in the dead of night when whatever computer is available is not busy doing its official and useful tasks.

There have been very real battle casualties among the players of Spacewar: people who played late into the night, then fell asleep in class or on the job the next day; people who were caught by some dour and humorless guardian of the computer, who'd rather see it idle than engaged in frivolity.

The playing of the game is simplicity itself. The computer is merely the "board" upon which the game progresses, and does not intrude any programming complexities upon the players. A simulated radar display of two spaceships is generated upon a CRT display terminal, and each player has a control panel which "flies" one of the spaceships. Pushing the rocket control forward fires the tail rockets; pulling it back fires the retros in the nose. Pushing the gyro control to the right makes the ship rotate clockwise; to the left, counterclockwise. And pressing the little red button will fire torpedoes at your opponent's ship. If you hit him, he'll blow up. If *he* hits *you, you'll* blow up. (That's where the strategy starts coming in.) Those are the essentials of Spacewar.

Besides the two spaceships, most games have a background of sun and stars upon the screen. The stars have very little effect upon the game; they provide a fine "atmosphere" to put the players in the proper mood and serve as motionless reference points useful in judging ship velocity, but have no other effects. The sun, in the center of the screen, is quite another matter. It has a gravitational field so the ships can orbit around it; and it is dangerous. Get too close, and *pfftt*—no more ship. Just a pretty sparkly explosion which doesn't last long and looks good only to your opponent.

The sun is the major factor in the game, only slightly less important than your opponent. It destroys more neophytes than enemy torpedoes. Dozens of times I've seen a really good beginner make a perfect shot and destroy his opponent—only to

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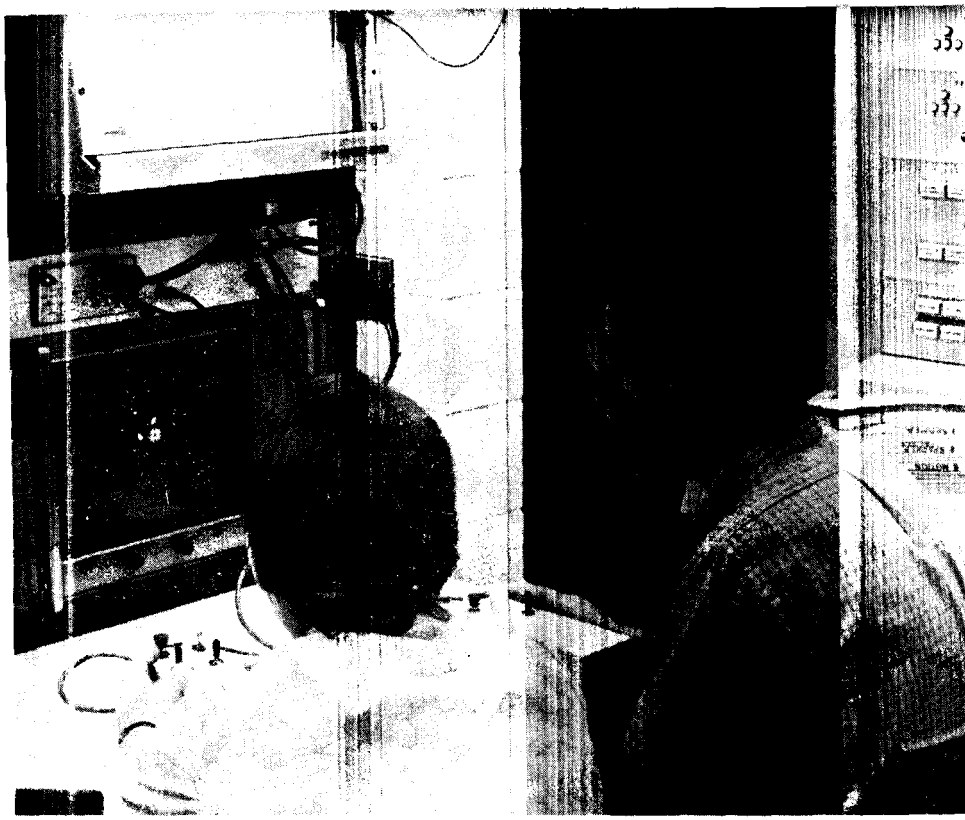

Closing in on ***each other.***

find that while he was lining up the shot he had got so deep into the sun's gravity well that his rockets couldn't save him. No matter how many games you've played, you're a beginner until you've learned to keep the sun constantly in your calculations. And when you've learned to *use* it, you are well on the way to being a master. For the sun is far more than a lurking trap for the unwary—it can be a definite aid. Due to the peculiar mathematics of orbital mechanics, some maneuvers can be far more effective when performed deep within a gravitational well. And fighting from close orbit has several advantages, not the least being that your ship is traveling in an ellipse rather than a straight line, and is consequently harder to hit.

Of course, few games are really as much *fun* when stripped to bare essentials, and Spacewar is no exception. Chess would be less interesting without "castling" and the peculiar behavior of pawns. Poker players have wild cards to use when they want added spice. And in Spacewar—imagine the possibilities, with a computer to keep track of all the odd things that might happen!

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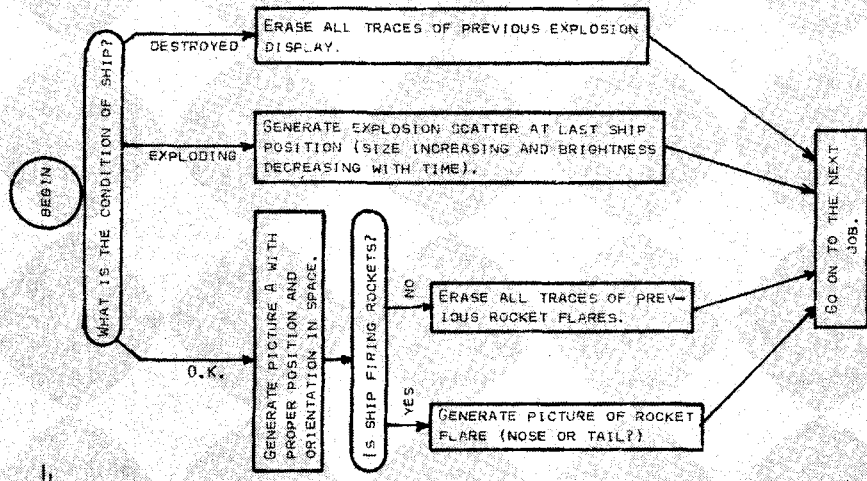
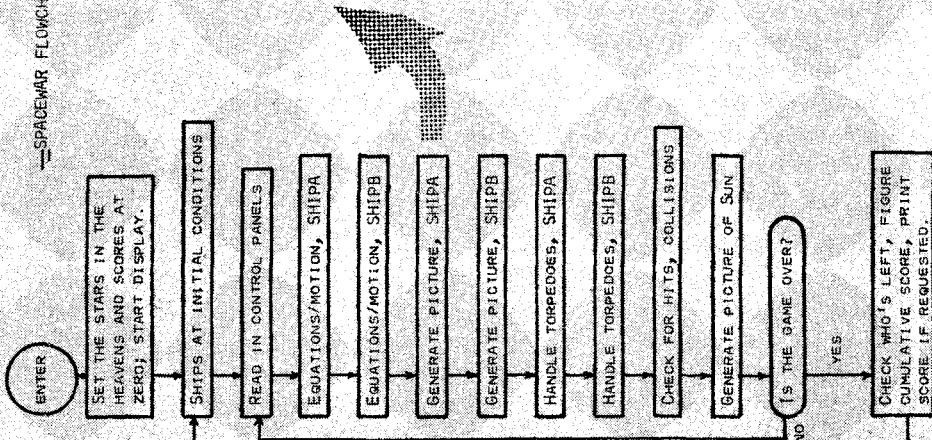
SPACEWAR FLOWCHART: Here the program flow is broken up into its elements, represented by the small boxes. The box labeled "Generate Picture, SHIPA" has been similarly broken into its smaller elements as a representative sample. Each box in the program could be similarly broken down, and it would be quite possible to break down the boxes in the detailed example into their *smaller elements.*


BEGIN
WHAT IS THE CONDITION OF SHIP?
DESTROYED
ERASE ALL TRACES OF PREVIOUS EXPLOSION DISPLAY.
EXPLODING
GENERATE EXPLOSION SCATTER AT LAST SHIP POSITION (SIZE INCREASING AND BRIGHTNESS DECREASING WITH TIME).
O.K.
GENERATE PICTURE A WITH PROPER POSITION AND ORIENTATION IN SPACE.
IS SHIP FIRING ROCKETS?
NO
ERASE ALL TRACES OF PREVIOUS ROCKET FLARES.
YES
GENERATE PICTURE OF ROCKET FLARE (NOSE OR TAIL?)
GO ON TO THE NEXT JOB.



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In every version of Spacewar I've run across, there has been an operative Panic Button for players to use when they find the enemy bearing down upon them and no escape in sight. And all of these panic buttons have been two-edged affairs with a built-in tendency to bite the finger that pushes them. After all, making escape dangerous is really the only way of getting the players to keep their fingers away from the Panic Button long enough for somebody to be shot down. And programmers have responded to the challenge with fiendish ingenuity!

In MIT Spacewar—the original version from which all others are taken—the panic button activates hyperspace generators. Your ship disappears, and after a while reappears elsewhere. Just *where* you reappear is determined by a random-number generator hidden away somewhere in the computer programming; and there is no assurance that you will like this new position at all. You might appear in the center of the sun, or close enough to it so you'll end up there. That's bad, but it's not likely enough to be really frightening, so: the hyperspace generators were made unreliable. The first time you activate them, there is one chance in eight of your ship exploding. The second time, there are two chances in eight; the third time, three chances in eight. Nobody pushes the button the eighth time.

While programming Minnesota Spacewar, I opted for a panic button involving skill rather than luck. The Minnesota Panic Button makes your ship invisible. Your enemy can't see you—but neither can you yourself. The advantage lies with the player who is better at mentally predicting trajectories—which is made simpler because the rocket flames are *not* invisible: any course alterations will immediately pinpoint ship position. Long periods of invisibility are dangerous unless your ship is in stable orbit; the sun may get you.

Another of the odd things that happen in Spacewar is best called "toroidal space." The ships are capable of building up quite a substantial velocity—it's necessary for a fast-paced game. But at these high speeds they are able to cross the entire CRT in a time on the order of ten seconds. And when a ship reaches the end of known space, what to do? Should it disappear, or explode, or fall off the edge of the Universe?

Programmers have found the answer to this problem in the old science-fictional idea of curved space—go far enough in one direction, and your ship will come back to the place it started from. When a ship reaches the right edge of the CRT, it reappears at the left edge. When it goes out the top, it comes back in the bottom. (I suspect the effect is much less distressing to players than to readers; it is harder to explain than to learn to love.) This is easy to program, for it is something digital computers will do automatically because of the way

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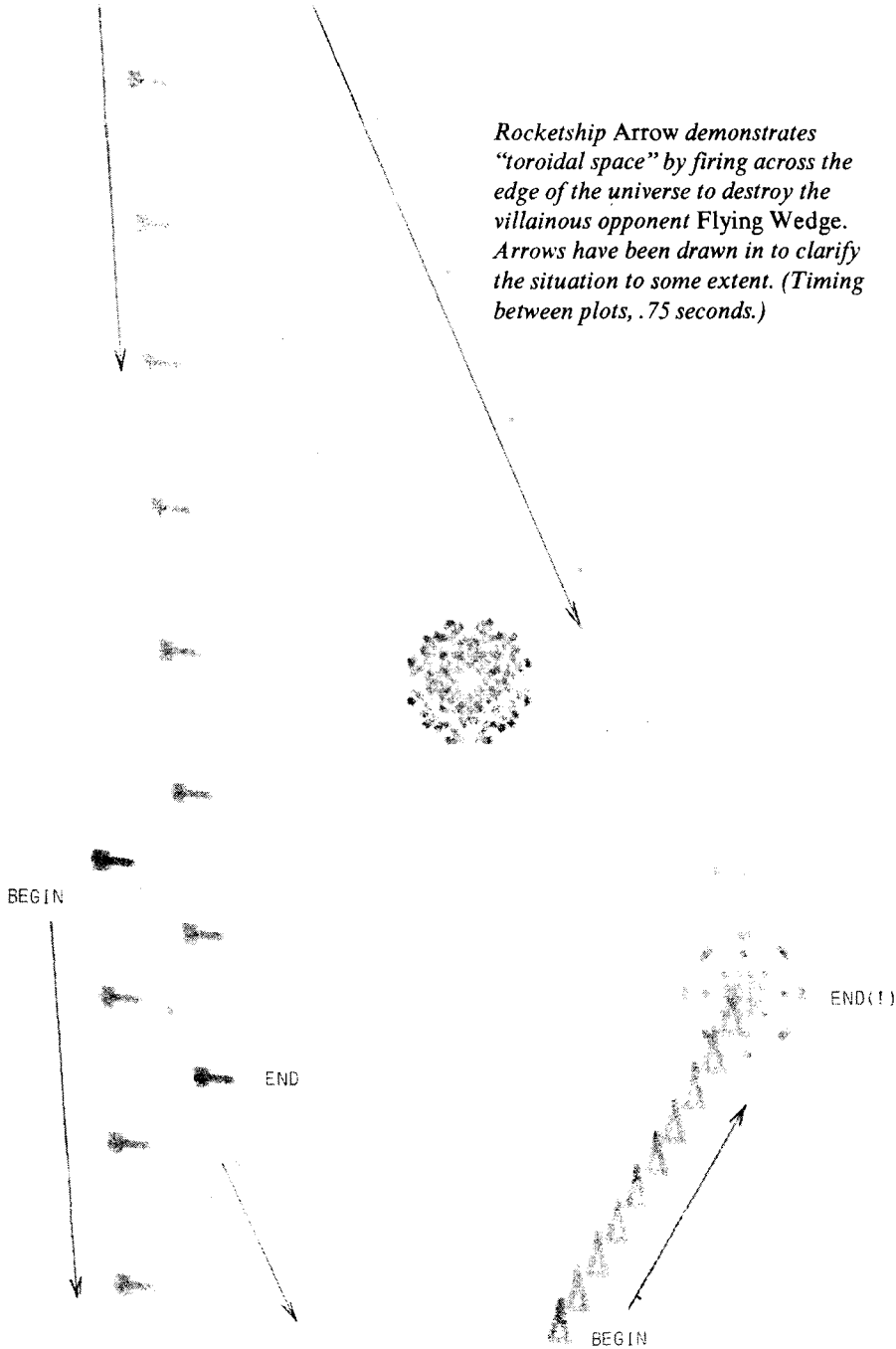

Rocketship Arrow *demonstrates "toroidal space" by firing across the edge of the universe to destroy the villainous opponent* Flying Wedge. *Arrows have been drawn in to clarify the situation to some extent. (Timing between plots, .75 seconds.)*

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they handle positive and negative numbers. It's quite possible that the original programmers of Spacewar were as surprised by the effect as anybody is upon seeing the game for the first time—but if they were, they realized they had a good thing going, and kept it. With the relatively small display terminals usually available, this little trick is the only thing that keeps the game from getting cramped.

Each version of Spacewar has its own minor details and limitations, depending upon the whims of the programmer(s) and the structure of the computer used. Fuel and torpedoes are often limited in the interests of realism, just as they would be for real spaceships. For example, in Minnesota Spacewar each ship has two minutes of fuel and twenty torpedoes. The torpedoes are fired at one-second intervals in salvoes of four or less, and have a lifetime of fifteen seconds. Each ship can have at most four torpedoes in action at one time. These limitations prevent space from becoming filled with torpedoes that long ago missed their targets but still are menaces. (Remember how live torpedoes and mines washed up on various shores for years after World War II was over? That sort of weapon is ungentlemanly.) Since fuel is consumed only when the rockets are fired, each ship has much more than two minutes of normal powered flight. I'm thinking of cutting the fuel supply in half, because in practice ships almost never last long enough to run out of fuel—and a limit that is never approached doesn't count.

THE PLAYING OF THE GAME

Spacewar is rather like chess or checkers, in that the game goes through certain phases in which the optimum strategies are quite different. In analogy with chess these phases can be called the opening, the

SPIN-AND-DRIFT with flip getaway. The good ship Flying Wedge *begins with a rapid spin to clockwise, while firing its tail rockets. When it is far enough from the sun that flying can be neglected for a moment, it turns to face the enemy ship* Arrow *(conveniently playing the part of a sitting duck in this enactment) and fires.* Flying Wedge *then continues its spin and accelerates past the sun, achieving an orbit rather like the "left" variation in Fig. 2. (Timing between plots, 2 seconds.)*

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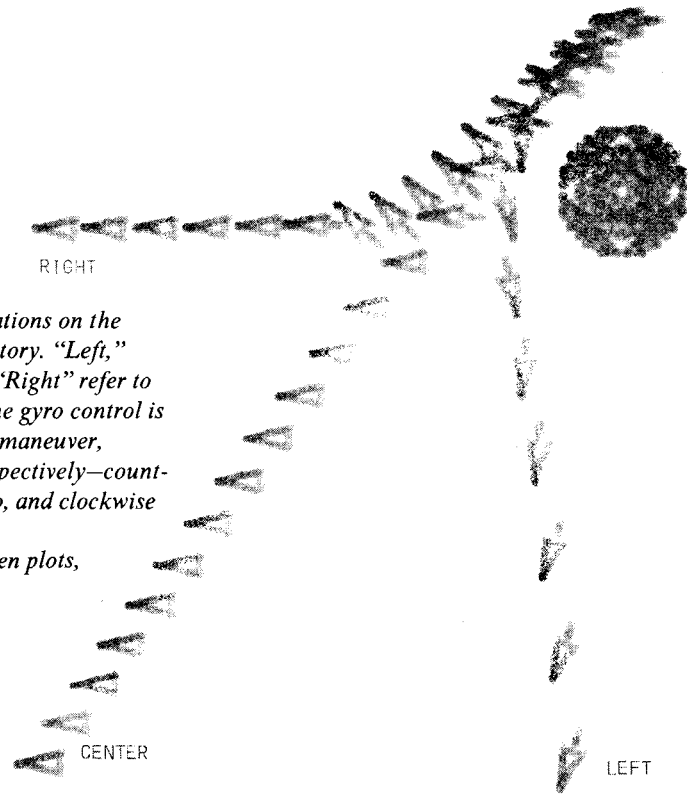

The three variations on the standard trajectory. "Left," "Center" and "Right" refer to the direction the gyro control is moved in each maneuver, producing—respectively—counterclockwise, no, and clockwise rotation. (Timing between plots, 1 second.)

midgame, and the endgame. The opening starts with both ships motionless on opposite sides of the sun, continues as they make orbit and jockey for position, and ends after the ships make their first firing pass at each other. If both ships survive this first pass the players then enter the midgame, in which considerations of tactics dominate –rather than orbitmaking, as in the opening. And the endgame limps in as one or both ships begin to run low on fuel and ammunition. Here a certain conservatism is necessary to winning: shots are placed more carefully, fuel use is minimized, and both players must be alert for kamikaze attacks by their opponent.

Since the ships start quite close to the sun, the first necessity of the opening game is to avoid getting trapped and destroyed by it—and even a second's hesitation can be fatal. There are half-a-dozen opening gambits to choose from during these first hurried moments, and the effectiveness of each gambit depends

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strongly upon the one chosen by the enemy. This calls for split-second decisions; the wrong response can be suicide. It helps to know your opponent's strengths and weaknesses—he's going to avoid his weaknesses, so out of simple justice you should avoid his strengths.

The spin-and-drift opening gambit is perhaps the best example of the need to know your opponent. It stations your ship close to most of your opponent's possible trajectories, and makes it almost impossible for him to shoot you without either falling into the sun or being destroyed in the explosion of your ship. If your enemy hates ties, well and good! He'll try to evade you, and you'll have a fair shot at him. But if he doesn't mind ties nearly as much as losing, he can take you with him every time and you might as well try something else.

Actually, spin-and-drift is *not* a good maneuver for winning—except with a very few opponents. It's dangerous, your foe can easily make it unprofitable, and it requires so much attention to piloting that there's little time to aim and shoot. The main virtue of this maneuver is something else altogether: it is superb for grandstanding. If you fly it well and pot your opponent truly, any audience you can find will be sure to applaud—and it's almost impossible to play Spacewar without gathering an audience. Winning isn't everything.

Unlike spin-and-drift, the three variations on the standard trajectory are extremely easy to fly. The "left"

The rocket-assisted fractional orbit. Note that first a short burst is fired to get the ship into orbit, followed by a period of drifting while the ship is lined up to point in the desired direction. The rockets are then fired, in such a manner that the rockets and the sun's gravitation add to give the ship a greater final velocity. This maneuver requires more precise timing, but somewhat less piloting ability, than spin-and-drift. (Timing between plots, 1.5 seconds.)

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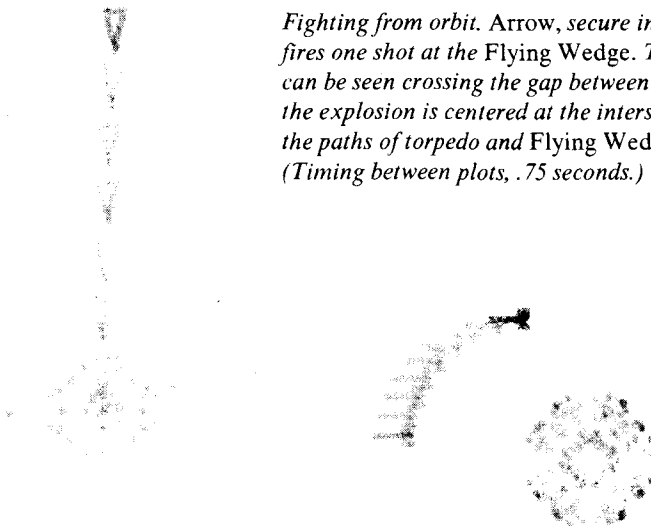

Fighting from orbit. Arrow, *secure in orbit, fires one shot at the* Flying Wedge. *The torpedo can be seen crossing the gap between the ships; the explosion is centered at the intersection of the paths of torpedo and* Flying Wedge. *(Timing between plots, .75 seconds.)*

variation is a straightforward, damn-the-torpedoes sort of attack, and is the maneuver you're most likely to use, and encounter. With it, your opponent has the maximum amount of time to prepare; the minute your ship starts to rotate counterclockwise he *knows* what you're up to, and can choose any orbit but spin-and-drift to counter your attack. But in effect his choice will be more limited than that; all he can really decide is whether he will close with you and slug it out, or evade. Victory goes to the best shot, and subtlety is difficult. The only real options available to a player flying this variation are the firing time and pattern, and the evasive maneuvers immediately following firing.

Because of the high torpedo and ship velocities built up while swinging far into the sun's gravitational well, there is little time for evasion and a good pattern of torpedoes is capable of bracketing most escape trajectories. With two good players persistently flying the left variation, Spacewar is reduced to the level of a sophisticated game of ticktacktoe: mutual frustration is far easier than a win for either side.

The "right" variation of the standard trajectory is ideal for declining engagement. In effect, it cuts out the opening game and gets on into the midgame without the formality of the first firing pass.

The center variation is seldom used in its pure form, because it ends up with the ship traveling along a diagonal of the screen. This forces the pilot to predict his trajectory a great distance past the "corner of the Universe" to avoid flying into the sun. Piloting then becomes more im-

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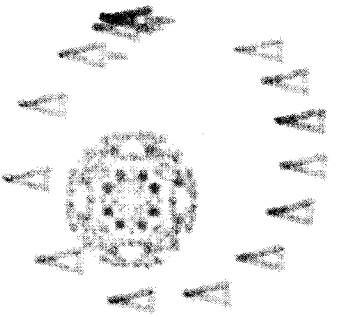
portant than fighting—an excellent way to lose. Therefore, the usual pattern with this opening involves flying out to the corner of the screen and altering course.

The best things about the standard patterns is that they are so easy to fly that even a beginner can concentrate on wiping out the other guy rather than worry about piloting. Some expert players will even fly them invisibly—normally a difficult thing to do—and still have a good enough idea of ship position and velocity to fire accurately. Unfortunately, this trick doesn't wear well, for it depends primarily upon shock value for its effectiveness. If the invisible attacker sticks to the standard patterns his enemy can quickly learn where to shoot; and if he leaves these well-worn paths he *himself* can't keep track of his ship.

My own personal and favorite opening maneuver is the rocket-assisted fractional orbit. Properly used, it can be *fiendish.* Basically, you get into a *very* close orbit and use your rockets to assist the sun's gravitation. That whips you around the sun twice as fast as a normal orbit, and if you time everything properly you'll go flying up your opponent's tailpipe as if you were shot from a sling. He'll be destroyed before he can even turn around and shoot at you. The natural counter-pattern for this gambit seems to be spin-and-drift; and since your opponent must commit himself to spin-and-drift well before you commit yourself to a fractional orbit, it won't be pulled on you unless you become too predictable.

Orbiting the sun is a useful maneuver at the beginning and the end of a game. In the beginning, it's the purest form of fighting; for once a stable orbit is attained, you need pay no attention whatsoever to flying the ship. All your attention can be concentrated upon your enemy. In addition, your orbital velocity is added to the torpedo ejection velocity—and close to the sun, orbital velocity is considerable. But this orbital velocity is only useful when you're in a portion of your orbit where your ship is headed roughly towards your opponent. The result is firing "windows" very similar to the launch windows for Moonshots or planetary probes. It's quite possible to miss an otherwise easy shot because your ship is in the wrong portion of its orbit. However, your opponent is at a compensating dis-



The rocketship Flying Wedge *going into an elliptical orbit about the sun. (Timing between plots, 1.5 seconds.)*

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advantage; for your ship is moving rapidly along a curved path, and can be a most difficult target for all but the most experienced players.

In the endgame, when you are running low on torpedoes and fuel and your opponent has the edge, a distant orbit is the safest hiding place you can find. Get into a large orbit, go invisible, and what the devil can he do? He can blunder around until he collides with you, shoot off all his torpedoes in the small hope of hitting you by accident or guesswork—or resign, and give you a tie. (And if he *should* shoot off all his torpedoes in a vain attempt to hit you, you can then reappear and stalk him with your one remaining shot!)

WHERE THE *REAL* FUN IS

The perversity of the various "panic button" provisions should serve as a warning: Spacewar can be a most peculiar game. Although it uses a computer to handle orbital mechanics, physicists and mathematicians have no great playing advantage—John Campbell's seventeen-year-old daughter beat her MIT student-instructor on her third try—and thereafter—while the most promising player I've seen was a theology student. Good reflexes and an eye for motion seem to be far more important than training in the concepts involved. And most perverse of all, the fun part of the game isn't really playing it—it's writing the program.

Now, I'm not knocking the actual playing of the game. I like it, and when my win ratio starts dropping as it has lately, I am unhappy. (The other players are simply getting too much experience; I had best rewrite the game and change it around.) But I've reached a bullfighting sort of attitude towards winning: the point isn't just to kill the bull, it's to do it with dash and style. I'll go for both ears and the tail every time.

The one thing that's more fun than playing is to go for both ears and the tail while writing the program. I've done three versions of Spacewar so far, and each of them has been more elegant than the preceding version.

Version I was a crude, get-it-working sort of thing that was fun to play, but really only served to define the programming problems.

Version II was slightly faster and had a few more features.

Version III has bells and whistles: it keeps score—which none of the earlier versions did—and the two ships are no longer identical—which helps in playing the game, but makes the programming harder. But I'm proudest of things that don't show, things buried deep in the programming. Version III is a bit faster than the earlier versions, even though it's more versatile. The torpedoes are handled in a much more compact and elegant manner. The display programming is more streamlined and requires less memory and many fewer instructions.

These are little things, but I've learned a lot of programming by doing them. Few things are more en-

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joyable than tackling a hard bit of thinking and problem-solving, just for fun. It's rather like working out crossword puzzles or mathematical brain teasers, and the best part of it is that you're learning some very useful things even as you enjoy yourself.

This way of looking at Spacewar seems to be widespread. The history of the MIT Spacewar game—a much older game than the Minnesota version—shows a definite progression from the early days when much programming was yet to be done, into the—well—*stagnant* period after the game was refined and polished.

The first few years of Spacewar at MIT were the best. The game was in a rough state, students were working their hearts out improving it, and the faculty was nodding benignly and smiling as they watched the students learning computer theory faster and more painlessly than they'd ever seen before. It was an education for all concerned. The students were doing creative and difficult program design and debugging, and the only problems in sight were the few students who neglected their other studies to concentrate on Spacewar. After all, it looked *so* much like the things they came to school to study that it *had* to be good for them! And a background of real-time interactive programming was being built up that anybody in the school could draw upon; one of the largest problems in the development of the game was learning how to talk to a computer program, and have it answer back. Knowledge of this sort is useful whenever interaction with a computer is desirable, and many of the faculty were starting to put it to use.

But the problems were eventually solved. All the rough edges had been trimmed from the programming. The CRT display looked as realistic as possible. The only real program development going on was done by a couple of students trying to introduce a computer-piloted flying saucer to occasionally zoom through the game as a kind of "wild variable." To the best of my knowledge, they never got it working. Students were still *playing* Spacewar, but with all the problems solved it was rapidly degenerating into pure recreation—and even gambling. Nobody was learning anything—except orbital dynamics—but they were taking up valuable computer time. The faculty became less benign; *they* wanted to use the computer. And Spacewar at MIT drifted off into the sunset.

Spacewar drifted off into the sunset, and so did a lot of the players. It is in the nature of MIT graduates to wind up at installations with computers; and with a new computer, the fun can start *all over again!* For each computer installation is different, requiring different programming, and there's a whole new bunch of people to make appropriately reverent and excited noises when they first see two little spaceships on a computer display. ■

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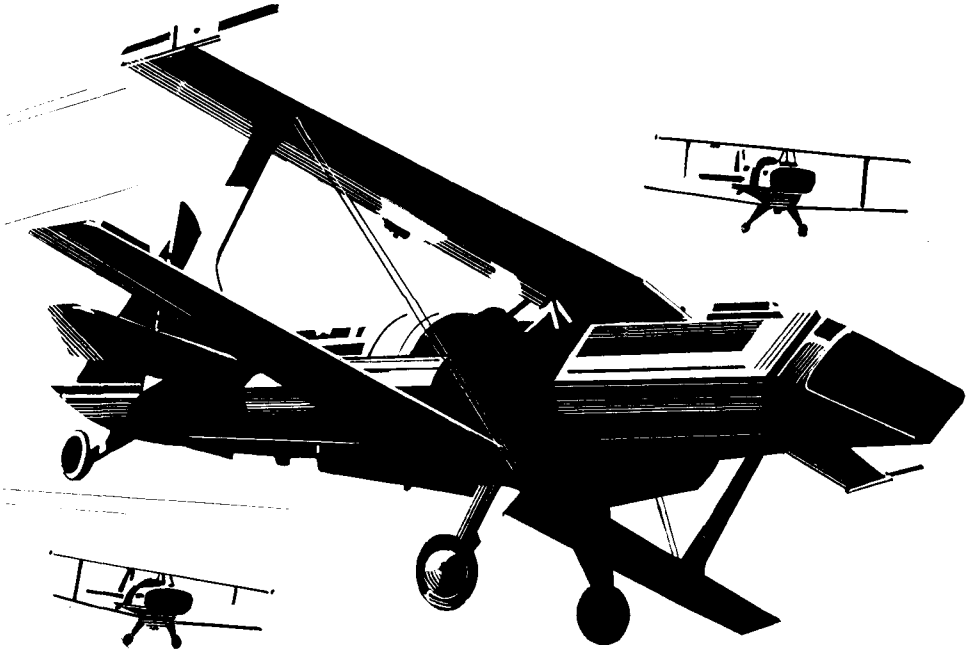

a little edge

There can be situations in which War is the only possible answer—
and Peace negotiations completely impossible.
Where annihilation of the enemy is the only answer—

S. KYE BOULT
Illustrated by Vincent Di Fate

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Baron Amarson always heard a silent fighting scream from the stuffed Drak head whenever he turned up the lights and saw it come out of the darkness. His ears pointed rigidly, the hair on the back of his neck and head and around his mouth stiffened as the fear instincts armed his nerves and bloodstream for combat. The tight alertness was not a bad feeling for the start of the day and Amarson always enjoyed the emotions, even if they were unnecessary. He was in his war room at Flight Base 12, many miles from the nearest live Drak. The one he was looking at had lost all interest in killing and eating Amarson two years ago when it became a trophy instead of a deadly enemy.

The Drak head, mounted over the war map board, glared down out of malevolent oval eyes. It was mounted with the feathers on the sides of the head sleeked back as though by a wind. The head was cocked to one side and the curved orange beak half open. The effect was of a Drak diving to attack anyone who stood in front of the war board. In this case, this morning, it was Amarson and the Ambassador Theiu of the River People to the south.

Amarson was in uniform, the leather of a flight leader. His jacket was a deep brown, only a shade darker than the skin of his head and hands. It bore an insignia of arms that told his family rank and the shoulder badges of a Flight Commander. The ambassador was a civilian, dressed in a pale-blue coverall over a silver gray skin that looked slightly wet. He was visibly nervous.

"You will forgive a guest, Baron Amarson," he said, "but that is a barbaric trophy."

Amarson looked down at the round gray head beside him. The Riverman was less than half his height.

"Trophy, Ambassador Theiu?" He had been studying the map intently and did not understand.

"The Drak," said the little man. "It looks ready to kill." He pulled a flask from a pocket in his coverall and sprayed water over his head, nervously wiping his flat nose and wide eyes with one hand. The hand was webbed.

"Oh, yes," Amarson looked up. "The taxidermist was a genius. Makes you want to fight just looking at it, doesn't it?"

"You perhaps, Baron." The ambassador used his spray again. "I am forced to remember that the Draks consider me very good to eat. I would rather be in a deep pool.

"Do you always use this . . . thing, to inspire your combat flights?"

"Yes," Amarson said. "There is the enemy and the land he controls. I can stand in front of one wall and hate them both.

"Don't worry about this Drak, Ambassador. See, we have clipped his wings." He gestured across the top of the map. The Drak's two great

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leather wings, severed from his body, were spread against the wall.

"Forget the trophy and look at my map. There in the north, the mountain peaks marked with purple striping, are the great Alp stronghold of the Draks. My fliers cannot get at them in those canyons and peaks. Below that is the jungle barrier. It also shows as Drak territory, although we can send ground troops, our Jungle Patrols, into that area."

"As soon as you leave the Drak fly back in and then attack the Valley farms," the ambassador finished. "I have read the complaints."

"The only thing I can hold is the air over the Valley. My bases are the triangles." Amarson indicated a curve of numbered triangles arcing between the jungle and the valley plain. "Bases Number I and Number II cover your River People in the east. I have two more flights based west of me here and the coast of the Mud Sea. Base XII is nearest to the Drak mountain passes."

The ambassador became paler at that reminder of his danger. At the tip of each of the mounted Drak wings he could see the large metal XII's—the number of Amarson's own field.

"We hold the air, when the Drak fly hunting patrols," Amarson said. "The people of the plain and your cities to the south are getting all the protection we can give them."

"You have cities in the plain too, Baron?"

"Yes, and they are on the frontier, close to the Drak," Amarson growled. "The Drak hunt us for food, too, Ambassador."

"But they don't find you so easy to pick up and carry away," the ambassador sprayed his head again. "We are small and light."

"And *we* tend to fight back," Amarson snapped, then he went on contritely. "Sorry, Ambassador, that was unworthy. Your Rivermen craftsmen give us the weapons to fight Draks and we have made treaties to fight Draks for you and the Valley People. Well, that's where our honor lies. We fight Draks, kill Draks. My business is fighting back.

"And fighting back is what I am going to do today."

With a quick movement Amarson drew a straight yellow line from the Number XII triangle, east and north, across the coast and out into the Mud Sea, behind the mountains. At the end of his line was a group of islands, Drak held. He wrote course numbers and times along the line and then signed his name directly below the triangle: *Leon Amarson Baron Rufus, Commanding.*

"That's the first attack order I've signed in three months," he said. "Defensive patrols! The best of my men are getting killed on defensive patrols."

"You know we must have the Draks driven away during these months," the ambassador said." I was against your flight when it was proposed. An attack now may bring

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them down on us during the harvest. I know you need to try this new weapon, but the Valley harvest and our Fish Catch are vital to the war at this time. We must be supplied before the Drak swarm."

"Holding the Valley and the River is not my idea of war." Amarson's lips parted in a snarl along the length of his long nose and head. His ears twitched up and his eyes narrowed. He clenched his fists and moved his feet inside his flight boots. The leather of his flight gear creaked as his leg muscles tightened and relaxed.

The ambassador shifted away from him a bit. For a moment the expression on Amarson's face was very much like the one on the mounted Drak head. The ambassador was remembering old legends about the time when Amarson's people had also found the small Rivermen very good to eat. The memories did not help his nervousness.

"May I disagree, even as a guest, Baron," he said. "The Drak are not at war. It takes two sides opposed in national pride to make a war. The Draks are only hunting. They consider us a food supply only, Baron. They harvest us the way we harvest the riverfish; without thought, communication, warning, or declaration of war. They simply kill; to eat. Your fliers, I suspect, are considered a specially dangerous kind of game animal.

"Oh, I know they wear armor, use weapons, and can think and fight, but they truly are not making war."

"War!" Amarson growled. "What we do isn't war either.

"The Draks are back there in the hills breeding, now. In three months they will swarm out. Every Drak that can fly will head south looking for food. Then you'll get your war, Ambassador, as we have every season. They will fly to kill and we will be driven back to the river. War? That's not war!

"Look at the map. I can't get into the mountains to finish the fight. My fliers can't stay in the air in the passes and canyons. The Draks only come out in small groups to hunt, or to attack, my fliers. Then they swarm. They kill us in the air with swords and spears, but it isn't war. I kill Draks because they always attack and will kill me if I don't, but it isn't war!" He slammed his hands together to control his anger.

"For six years now, I have fought them like this, futilely. I have seen cooked half eaten bodies left by the Drak after the swarm. Permit me my honor, Ambassador. There is no honor in being someone's reluctant supper. I have more honor fighting a war to kill all Draks, everywhere. So I must call our fight a war. I am a warrior, not just an angry food animal!"

A clear bell rang three times. Amarson shook his head and relaxed visibly.

"It is almost sunrise. Will you come to the Shrine with me Ambassador? Our chants this morning

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dedicate us to combat, but you are welcome.

"This war of ours has little honor in it except the protection of the lives of the Valley and River People. The Shrine pledges us to that, even when we use the Warrior's Rites." Without waiting for a reply he turned and walked into the adjoining Shrine. Time enough for brooding and philosophy later; this morning he had to lead an attack to kill Draks.

All of his Flight were kneeling before the Shrine, waiting for the first light of the Father Sun to shine on the altar.

Above the altar were the representations of the two suns and the World, hanging in the divine three-body position. The Father Sun was a great disk of red crystal fully as large as the golden globe of the planet behind it. The Younger Sun was a small ball, barely two fingers in diameter. It caught the light of the altar fires and sparkled as it turned. At the ritual time the sunlight from the Younger Sun would turn it into a golden ball of flame.

The adjutant, as eldest-to-them-all, began the chant of the rising. The silver hair along his mouth and beside his ears gleamed the honor of his age as he lit the new altar flames for his prayer.

Suddenly Amarson whirled, brushed the ambassador out of his path, and strode out of the stone Shrine onto the flight field. The artificial emotion of the Shrine made his breath stop in his throat. His moodiness, the talk with the ambassador, demanded a return to basics. He wanted to dedicate himself to the rising ritual out here in the open. He wanted to see the physical rise of the Father Sun, the brightness of the Younger Sun, and wait with upraised eyes for the Rite of Pausing, as the Younger Sun stopped in the sky.

Today was a day for greeting the Father Sun in the open and alone. This morning the Flight flew to attack Draks and some of his men would die. It would be under his leadership that they died, and he wanted to feel that they died as men, warriors, not as food for obscene winged Draks. So he felt a need for the old rituals, out here in the open under the sun, as it was done before man learned to fly into the red and yellow sky of the dual suns.

The deep darkness gave way slowly to the dim red glow that preceded the rising of the giant red sun. The Father Sun rose first of the two suns. It came up slowly, ponderously. It literally covered the horizon as its giant size was magnified by the thick air near the ground.

Amarson picked up the chant from inside the Shrine. The deep red light glowed on the silver disks at his shoulders as he passed his hands over them and across his heart, then back to his lips in the ritual of the morning greeting. Inside the Shrine, Amarson's men performed the same ritual as the red light glowed in the

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disk of the Father Sun above the altar.

Before Amarson, Base XII became visible in the morning light. He faced a wide square field of open ground planted with multicolored grasses to confuse Drak eyes and hide it from the air. To his left crouched a line of five fliers, their motors rumbling in the stillness. Beside the wings of these fliers stood a group of groundsmen. Amarson felt them watching him intently, even though he did not permit himself to look at them.

Slowly he knelt on both knees and held out his arms in the old gesture of the ancient ritual. Out of the corner of his eye he saw three of the older men follow him to their knees, then he could see no more. The small yellow Younger Sun rose. It jumped swiftly over the hills and arced up one eighth of the way to the zenith. There it appeared to stop and hang in the sky to wait for the stately arise of its giant partner. This was the Rite of Pausing.

At first the yellow light filled Amarson's eyes, then as the sun rose, the light from it shrank until the sun was a pale moonlike star at the pausing. The fading yellow light left the deep red color of the Father Sun to bathe the field and buildings. The Father rose higher.

The kneeling figures continued the movements of the ritual. The ceremony was an ancient challenge to the Drak. A warrior kneeling in the open like this would be instantly attacked by the first Drak to see him. It had been a way for untried warriors to kill Draks and gain much honor.

Even now, Amarson found himself looking at the sky with all his senses alert. There would be instant, unthinking combat if a Drak flew over. The nearest Drak was in the jungle at the base of the Alps, but the instinct to kill Draks burned violently during the ritual. Amarson's pulse pounded in time to the chants.

Guided by the words of the chant, Amarson lowered his eyes to his hands. The skin on his closed fists had turned a pulsing blood red in the light of the sun. Slowly he opened his fists and let the red palms face the sun.

"The blood of my enemies on my hands, before your next light," he chanted, for so the old ritual ran. "Blood from the Father will be returned in blood."

He ran out the claws on his fingertips. The red light covered them with blood also. His skin shivered as he forced an outward calm against the racing pulse and rising emotions that swelled in him.

Aargh, a really barbaric ritual, he thought. *The little ambassador must be washing his face continuously at this. I wonder if he's ever seen our rituals before.*

"Father bring me to the blood for my hands. Blood that only stains the hands!"

He completed the ritual and sheathed his claws. Already the light

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was fading, as the Father Sun moved up through the thicker air on the horizon and the morning light took on its normal orange-yellow color.

Amarson overrode his pounding heart, calmed his thoughts and stood up. He forced himself to walk slowly over to the line of waiting fliers.

Emerdan, the chief groundsman, came to meet him. The man's hair was iron-white even in the morning light, and like the adjutant the hair at his mouth was bearded as an indication of age as well as rank. The knees of his uniform were spotted with two disks of dust. Amarson noted the dust and knew his own uniform was marked the same way. This old soldier would be one of the ones to kneel in the old ways, of course he would. The pride of men like this was to be expected; counted on.

"How many fliers do you have for me today, Chief?" He held his voice to an even conversational tone.

"Five on the line, Baron." The groundsman flung a hand in a wave to indicate the flapping tents hidden in the trees. "Seven in the tents for repairs, three out by mid-passage and the rest before dark. The tents will be empty and ready for these five when you bring them back, my lord."

"I may not bring them all back, old man," Amarson said. "But have the other fliers ready for tomorrow. We will use them."

The groundsman swung his hand upward and placed it on Amarson's shoulder insignia in a salute to acknowledge the order.

"The men know you cannot bring them all back, sir," he said. "They follow you to fight the Draks. Still they follow you; you still lead the pack, Baron."

"I still lead," Amarson nodded. "And I lead men not cubs. If they were cubs, I would bring them all back. Because they are men it is part of my honor to spend their lives."

"The fact that they are men, sir, that gives them lives to spend with honor. They fight Draks like demons."

"I know, Chief," Amarson smiled. "I can't complain about the men I lead." He shook his head sadly. "I only complain about the lack of fliers. It's not a very heroic thought, no honor in it at all, but I would spend more lives if I could bring back the fliers. We have more demon men of honor, than machines of war."

"The blood only stains the hands."

"The blood only stains the hands," Amarson repeated the ritual. "But what stains your hands, old man? The lubrication of these fliers, heh? You treat them like cubs." He smiled to emphasize his joke.

"Perhaps I do," the chief laughed. "But these I have for you today are no cubs. Come look at the claws the Rivermen have built for them."

"I want to see them, and so does the Riverman Ambassador." Amarson turned and beckoned the small

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gray man over to him. "Come with me, Ambassador Theiu," he said. "We are going to look at your toys now."

"We have taken the rocket racks off entirely," the chief indicated the nearest flier. They walked over to look up at the wings. "The Design College has ordered your whole Flight equipped with these dart throwers, Baron." He pointed to the upper wing panel. Fitted onto its under surface was a belt of woven wire holding hundreds of short darts. The belt came out of a hopper in the fuselage and ran out to a flat mechanism outboard of the braces holding the wingtips at their flight spacing.

"That's the launcher?" Amarson asked.

"Yes, my lord. They are all very well made. The best Riverman work. We had no trouble fitting them." The chief raised his voice to include the rest of the men who had come up behind Amarson. "The launcher is located outboard of the wing-tip braces for two purposes." His voice droned into a parade-ground lecturing tone. "Purpose one: Is to stabilize your flier when the launcher fires. There is a recoil with the mechanism. Purpose two: To provide a wide base necessary for aiming at a flying target. The missiles ejected from the launcher will cross two hundred feet ahead of your flier.

This is a Margroth Mark II Cyclic Launcher. Its rate of fire is sixty darts per heartbeat. Thus you see, we have an advancing wedge of darts, two hundred feet ahead of you, as you fly into the attack . . ."

"Darts? No rockets?"

"Sixty darts a . . ."

"How does it work?"

The chorus of questions broke against the air.

"As you were!" Amarson stopped them as they bounced around the wingtips. "Listen to the Chief, you cubs!"

"Can we kill Drak with these?" Somebody asked, as they quieted and considered the new weapon.

"Yes, you can kill with these," the chief said. "We hope you can kill at a distance." He motioned to his crew.

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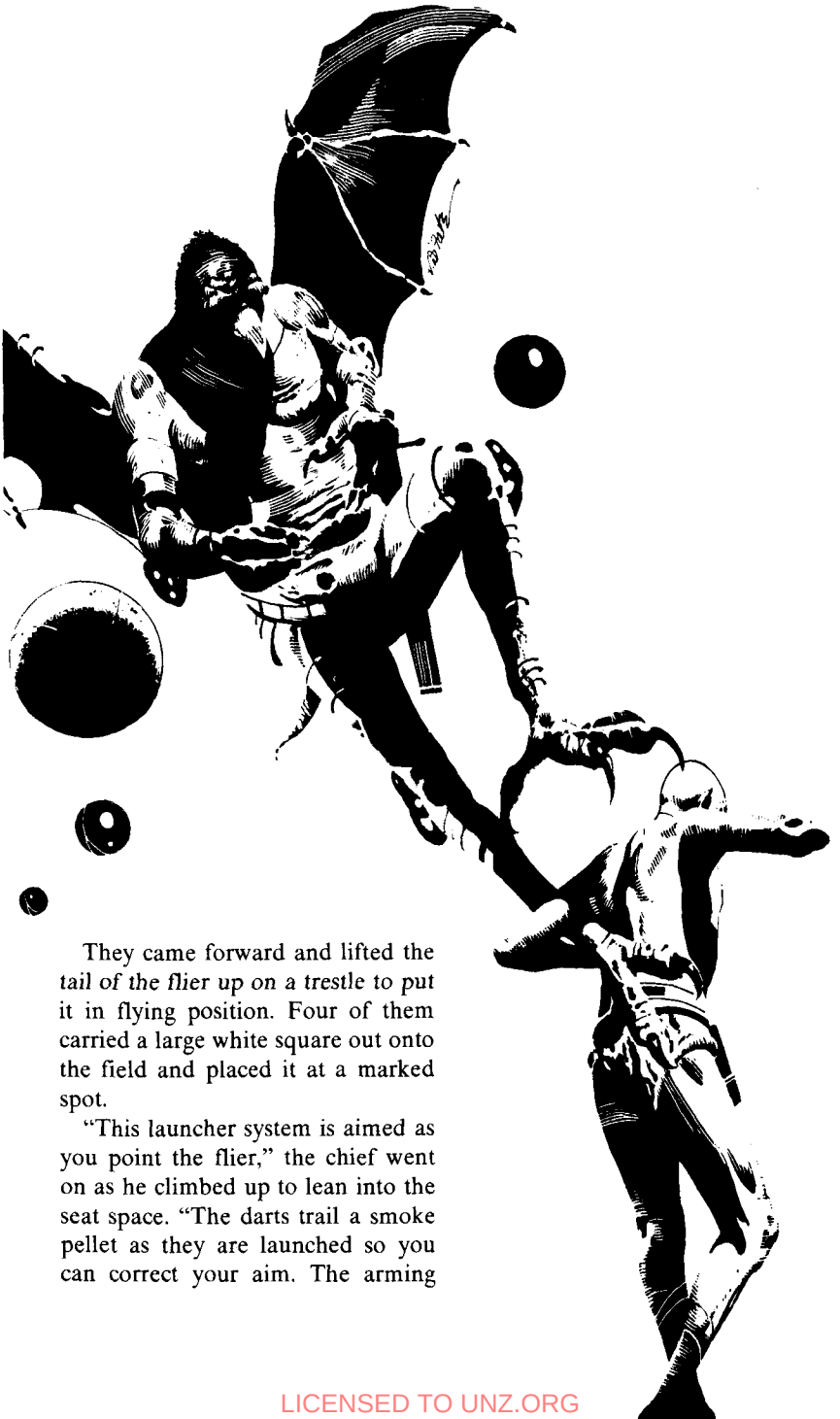

They came forward and lifted the tail of the flier up on a trestle to put it in flying position. Four of them carried a large white square out onto the field and placed it at a marked spot.

"This launcher system is aimed as you point the flier," the chief went on as he climbed up to lean into the seat space. "The darts trail a smoke pellet as they are launched so you can correct your aim. The arming

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switch is located on your panel. It must be turned on before you go into combat. To fire the launchers, you press the red button on the control column."

"Stand clear of the flier, please."

When he had made sure that the area to the target was clear, the chief reached in and turned on the arming switch.

"Arm the launcher. Aim your flier at a Drak. Fire!"

He pressed the button. There was a rattling clatter as the darts moved into the launcher and were thrown out at the target. Over a hundred darts rushed through the air before the chief released the button, but no one counted the heartbeats. They all stood in shocked silence staring at the gaping hole in the white target, two hundred feet out on the field.

"Brutal. I had no idea . . ." the ambassador said. Amarson felt the wetness of the spray against the back of his hands.

"The blood only stains the hands," Amarson said. "I think we can kill Drak with this toy, Ambassador. Yes, I do.

"Orders, my cubs!" He went on, commandingly. "Five of you follow me this morning to test these launchers. Did you get your courses?" They had. "Very well. Now, hear me. We fly to see how these launchers work. *That* is our mission. Avoid single combat. Stay away from the Drak. Don't give him a chance to use his spear or sword. This thing kills at a distance. Learn how to use it.

"When we sight the first Drak flight I will signal the group into a single line. Stay lined up. Don't get ahead of the flier on either side of you. I want all of those darts to go into Drak, not into my fliers.

"After the first engagement we may break up into pairs. Watch for my signals and stay together. Understand? Don't get pulled into pack fights, or boarded. Your honor is in these launchers and the way they kill. Let's leave the Drak hungry!" He looked at each of the five men. Yes, they understood.

"Your honor, my cubs, is in these launchers and the way they kill. When we get back I will begin a regular schedule of practice flights against targets. You five men will act as teachers for the rest of the command.

"But the Rivermen made these launchers to kill Drak, so let's go kill Drak!

"Thank Ambassador Theiu for your new toys and get your fliers in the sky!"

The five men saluted the ambassador with laughing thanks, ran to their fliers, and began to start the engines. Amarson waited until the ground crew lowered his flier down from the trestle, then he, too, saluted the ambassador, climbed into the seat and tightened his flying straps.

"My Lord," the chief was at his side, "you will be low on darts near the end of the combat. I used nearly a hundred."

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Amarson nodded, his voice murmuring the starting ritual prayers. The ground crew plugged the long nose of the starting cart into the engine and waited for the end of the ritual. Amarson soon finished and called out, "Power to start! Controls back!"

The man on the starter fired the charge. A flaming blast of gases shot into the engine and slammed against the single cylinder, spinning it in the combustion chamber. The engine caught smoothly and ran with its usual throbbing roar. The crew pulled away the cart and the chief followed them.

Amarson looked down the line of fliers. All five of the engines had started. He held his hand in the air to question whether they were ready. Five hands were lifted in answer. Amarson looked back to where the chief groundsman stood. The old man raised his arm to signify that his men were clear, then he turned the unpraised hand over and opened his fingers, extending his claws; the old religious salute of the warrior.

"The blood only stains the hands, old man," Amarson shouted into the engine noise. "I will bring you my kill."

He dropped his hand and shoved the power control to take-off power. The flier began to move, rolling out on the grass-covered field. Halfway down the field, the flier reached its first speed point and slid smoothly into the heavy air. Caressing the controls Amarson held the flier parallel to the ground until the speed reached the second point, then he climbed steeply up the sky and turned to head for the sea.

The flier climbed out swiftly. It seemed to be in a hurry to get out of the heavy air near the ground and up into the lighter sky.

Amarson was hurrying, too. There was a long way to go. He wanted to try out these new Rivermen weapons over the island chain where he could expect Draks in small hunting parties, but not chance meeting a bigger swarm.

He looked around him for the first time. The four fliers rode the sky behind him. He had expected them to follow him in single file; instead they were fanned out two to the left and two to the right. He frowned, then smiled, as he realized that not one was flying behind another flier. The demonstration with the target had made an impression. He glanced back again, at the unconscious pattern the fliers had assumed. It might be a good combat pattern for these new launchers. All the fliers could fire at once.

He shrugged the idea into the back of his mind and turned to his flying. He had almost reached the height of the thermocline. Ahead of him was the barrier between the heavy air and the light air of the upper sky. Soon his wings would be fighting to break through the turbulent layer where they met.

He advanced the power control and tightened his grip on the flight

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controls. With the swiftness that the snarling gutturals demanded, he began to recite the penetration ritual. The words tightened his muscles, quickened his reflexes, and brought his blood pulsing to meet the air storm. His timing was good. He was chanting the final stanza when the flier hit the barrier. The heavy, near solid, thermocline threw the flier up and rolled it violently to the left. Without the stimulus of the ritual the flier would have stalled over on its back. As it was his hands moved strongly on the controls and held the flier boring through into the calm, lighter air above.

The engine sang a new higher pitch and lifted up into the air. He steadied on his course and looked back to see how the others had come through. Their formation was wider, but they closed it as he watched. There was no worry with these men.

Amarson turned to look ahead. The coastline was below him now. To the south the water of the River spread for miles along its delta and disappeared into the shimmering wet mud surface of the sea. The Mud Sea stretched off north and west as far as he could see. The high peaks of the alps were behind him to the north. Ahead on the very edge of the sky was the island group that was the home of the Drak clutch he was seeking. Now, for a time, their flight would be safe. The Drak flew on their own wings and their hunting parties did not fly out over the Mud Sea. No Drak could land on the soft, almost liquid mud and live. Amarson's fliers carried fuel range to let them make the approach across the sea and return, but they wouldn't meet the Drak until they got closer to the islands.

Amarson reached his flying height and came out of the climb. For a few moments he busied himself balancing the flier, for the long flight ahead; setting the engine power at the precise point to give him the most thrust against the thin air, with the smallest amount of fuel. He adjusted the muscles of his legs and arms to control the flier with tiny relaxed movements in just the right attitude for maximum range. These were things he set his mind and body to do smoothly and automatically as a first discipline of flight.

The ritual words for doing this drill were torn from his lips by the wind of the flight and blended with the roar of the motor. He knew he said them out loud and briefly, in the beginning, he heard himself, then his ears tuned to the sound of the motor and he did not hear. Soon he did not hear the motor. As the ritual action of his mind and body welded him spiritually with the flier he would be able to hear other things outside the flier, other motor noises, sounds from the ground, even the combat screams of the Drak when they were contacted. The ritual would free his senses to concentrate on anything that was not normal to the operation of his flier.

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Behind him, the other fliers flew smoothly through the air and the sea of mud slid below them. The arrow point of the five fliers held its shape under the red glow of the Father Sun. It was the time of mid-passage. The Younger Sun sank down the sky behind them and set. It would rise again when they were over the islands. Amarson had planned his flight so that the swiftly traveling Young Sun would light the combat zone and silhouette the flying Draks as they rose to meet him. Draks were hard to see, small, man-size, and Amarson didn't want them to get in too close. The yellow sun would help. Amarson was well satisfied with his timing.

He let his mind relax and slide down into the trance of flight. His pulse slowed and his controlling became instinctive. For a time he seemed to sleep, flying on and on, with no conscious thought, conserving and building his strength for the combat that would come.

The islands on the horizon grew in size and the first one of the chain slid under his wings before he moved again. A shudder seemed to run through his body and the flier rocked in response. He checked his flier with eyes that saw again and ears that were keenly alert. The engine was running smoothly. The fuel load was well above the half weight point. Good. If any rising Draks wanted to come hunting, Amarson's flight was at the combat zone and ready for them.

He unlocked the trigger switches on the dart launchers and reached forward to loosen the short curved knife fastened across the front of his instrument panel.

Suddenly, the flier just behind him roared its engine and slid up beside Amarson. Its wings rocked frantically.

Amarson sat up straighter and turned his head to see where the danger lay. Nothing was behind them.

Then he saw a group of flying figures below them, lifting from a point of a large island. He swung his hand flat over his head to signal his flight into the line formation he had planned for the combat. The fliers slid smoothly into place, but the man nearest Amarson was still rocking his wings and making negative motions. The nose of the flier lifted up and the man pointed forward and up.

Amarson scanned the sky ahead of the group. Nothing.

Then he saw it. Far off against the bottom of a cloud bank, a gigantic round object was hanging in the sky. Swarming around it were small black dots that could only be flying Draks. Draks already in the air, and at combat altitude; even higher! This was new.

Except for the swarming season the Draks had very little endurance in the air. Always they rose from the ground to attack. Now, they were already in the air, waiting.

Amarson tilted his flier to get a better look at the Draks coming up

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at them from the ground. Quickly he measured the distance.

"No," he said out loud, the wind whipping the words away.

The Draks below were no menace. By the time they rose to fighting height Amarson's group would be very near to that great ball and its swarming escort. Waving his arm in the no-combat signal, he lifted the nose of his flier and began to climb toward the new enemy. The rest of the group rode up and down on the air waves as they lifted with him. The entire fighting line pivoted to head onto the new course and then the men dropped back into the arrowhead formation.

Good men, Amarson smiled with pride. No cubs, these. No one screamed off to accept the fight with the lower Draks. They had all made the same decision. The unknown thing in the sky ahead was more important than a small pack fight.

Amarson went to one half combat power on his engine. A stream of dots had broken away from the ball and was headed toward him. Amarson held his speed and climbed. Just before he met the Draks he intended to pour on all the power he could get and fly right through their attack. He wanted to get up close to whatever that was, hanging there in the sky.

Amarson signaled his men, bringing them up into the single line formation again. When they were in position he went to full combat power. The flier pulsed under him and lifted to meet the enemy. They were closing rapidly. He could see the short spears they carried and the gleaming markings on their harness.

They were close enough.

"Now!" He yelled and triggered the dart launchers. Four of the stubby missiles leaped forward, the racks rattled and four more were launched. The noise startled him, and before he could loose the trigger, eight more darts were launched.

The other fliers had fired with him. The air ahead was filled with the darts, each streaming a tiny trail of smoke. Amarson had time to notice that all of the fliers had fired, then the Draks flew into the cloud of darts. The result was brutal. The Draks were hit and hit hard. Two of them spun into a third. More tumbled in the sky. They didn't have a chance.

Amarson lifted his flier to avoid the swarming mass and saw one Drak go rolling past. His body bristled with four darts and two more pinned his wings together. He was still clutching his fighting spear, his eyes and beak gaping wide with shock.

Then they were through the Draks and climbing beyond them. Quickly Amarson checked his men. All there. He looked behind him. The Draks were a jerking, falling group. Not one spread his wings to turn and fight. They were falling. Five, twelve, fifteen, Amarson counted. All dead or dying.

He shouted a prayer to the Riv-

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ermen. Glory to the maker of those dart launchers! What a weapon! This was the edge of a War Sword. Now the fight could be carried to the Drak. Now I can truly talk about war, little Ambassador Theiu. Spray your head!

And the whole group firing at once like that. A good tactic for the first clash of combat. It wouldn't do to try it more than once, though. The Draks were good fighters, they would learn fast.

He signaled the group to pair up and they wheeled out into two flier-fighting units. All of them headed on up toward the rest of the Draks. Amarson led his wingman out wide and up near the cloud. He wanted to see what they faced here in the sky. The thing hanging mysteriously in the clear air.

As he came nearer the ball became a brightly colored shape of painted fabric. Its strange colors made its outline hard to see; even this close. Hanging under the great ball was a wide wooden platform on which a number of Draks stood. Around the platform more Draks flew. There must be at least a hundred of them.

Ah, this was indeed a new weapon for the Draks. Here they could rest their wings, high in the air. The thing was a hunting camp in the sky. It could hold Draks and extra fighting spears. Yes, there they were, bundles of them, racked there. A dangerous weapon, indeed.

Amarson pulled his flier up and over the top of the ball.

How did it stay up in the air . . . and stationary? There were no engines on the platform. The cloth ball was holding it up. He could see the ropes. A sail like a boat? No, it must be filled with something like smoke. Yes, smoke from a fire lifted straight up in the morning air. Hold the smoke in a bag and it would lift the bag. That must be it.

But no more time. His men were going in to attack the Draks and here came two he could get. He rolled out at the top of his looping climb, checked that his wingman was in position, then tilted his flier over and slid down the sky at them. He loosed off four of his darts as he dove.

Ahiee, they missed. The Draks were moving across his path and he saw his darts smoke by behind them. His wingman fired and they were past and diving down at the colored ball.

He twisted his head back and saw one of the Draks spin on his wings and throw his spear. The other Drak was falling. Good, his wingman got one of them.

Amarson took his flier down past the platform under the ball. The platform was empty. All of the Draks were in the air. That was bad.

A Drak swooped up in front of him and Amarson triggered his dart launchers. The Drak crumpled in the air. He hadn't even thrown his spear.

Speed was the way to use these dart launchers. No more hovering

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and letting the Draks come in close. The Rivermen had done that much. *Now, we have a sharp edge to our sword, Draks! Come and feel it!*

Amarson continued on up around the other side of the ball and tilted to his left to see how the others were doing. They were doing badly. The air below him was filled with Draks.

As he watched, four of them hit one of his fliers. They flew right at it and clutched its wings and body. Their stabbing spears flashed in the sun. Amarson saw the pilot swing his knife and then the flier flipped over on its back and was gone.

Three swiftly moving fliers caught his eye, as they darted through a pack of Draks and winged up and over to dive back again. Somebody else had learned the trick of speed. Hit and run and let the dart launchers kill. Good men. Quick.

But there are too many Draks. We have to break off. Get out of here. Get away from this flying fort.

Amarson put his flier into a flat dive and unclipped the signal gun beside him. As he flashed through the thick of the melee he fired the bright white recall flares to order his men out and away home. He saw three of the swift fliers peel away and start back, but some of the others weren't going to make it.

As he went by the platform again, a group of Draks landed on it, snatched up spears and dove off again. That platform! He'd better do something about that.

He pulled around in a tight turn and held the trigger down as the raft came in front of him. The Draks coming up to rearm died, but the big fat ball still hung there. Amarson pulled up around its curve and climbed above it. Turning harshly, he flew right at the thing and triggered his dart launchers. He saw his darts tear at the cloth of the ball and he kept the trigger down as he closed in. He held it; kept the darts rattling off his wings, until the great colored ball filled the sky. At the last minute he swerved away, cursing.

The sky exploded!

Amarson's flier was driven down and over on its back by a mighty blast. Amarson had one swirling glimpse of the great bag exploding in a roiling ball of red fire, shot with black, then his flier was tumbling out of the sky. The exploding bag drove a shock wave across the sky. The flier shook and rolled ahead of it. Control was gone and Amarson waited for the crack of breaking spars and the rip of fabric.

The Rivermen's skill, the power of their gods, or the strength of their materials fought for him. The flier held onto its wings and wavered into a diving slide. A correction on the controls fought the nose out of its wild dive and Amarson turned back to gain altitude.

The flaming wreckage was still falling past his altitude and so were Draks. Some of them were on fire and some were caught in the wreckage, but the swarm of the hunting

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party was gone. The sky was almost clear.

Amarson pointed the nose of his flier for home and climbed for altitude.

Suddenly there was a Drak above him, diving. The flier shuddered with the impact as the Drak landed on the wing above Amarson's head, rolled off and grabbed at the body frame behind him. Amarson jerked his war knife out of its clips and cut at the Drak. There was a shock of pain in his arm and the Drak's head was split open in a spray of blood.

The flier rolled over on its back and the dying Drak fell off, tearing his short spear from Amarson's arm as he fell. The muscles of Amarson's arm jerked with the pain of the wound and the arm dropped uselessly over his head as the flier flew inverted. The fighting reflex of his claws dug into the knife handle and it did not drop. He continued the roll and brought the ship right side up again. The knife, a dead weight in his numb hand, flopped back aboard almost cutting his leg in the process. Amarson pried his claws loose and put the blade back in its clips while the flier carried him up past another group of Draks at full combat power.

None of them followed him. In seconds his speed carried him beyond them and he was safe.

He pulled the power lever back to control his fuel and leveled the flier onto the course for his base. He looked around, but the other fliers were out of sight. The Draks were all going down. He had the sky to himself.

"All the sky I need," he snarled out loud. "I have killed and the sky is mine!

"Maybe more sky than I'll need," he continued as he checked the fuel weight. It was low. Very low.

He probed his arm carefully, but there was nothing he could do about it here in the air. There was not much bleeding. The fighting reflexes of his body were sealing off the torn veins. Not serious there, but his arm wouldn't work. Well, that would have to keep. The trouble was the fuel weight and getting back. Forget about the arm and start to work on that job.

Amarson settled the flier in a very shallow climb and began the relaxing ritual chant to ease the combat tensions in his body. The flight home must be smooth and controlled. His fuel reserve was gone and the weight of fuel left would take all of his skill just to get the flier across the Mud Sea. There would be no room for jerky flying mistakes.

He was planning his flight with a gradual climb to give him as much height as he could get near the end. With height, he could float down the wind for a few more miles when the engine ran out of fuel. That hope, and an engine throttled back to minimum power, was all he could do now. That and wait. Wait, and guide the flier smoothly through the air, to take advantage of every foot of dis-

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tance he could get out of the fuel weight.

Any thoughts of a landing in the Mud Sea, or engine failure, or combat weakness in the flier's structure, were useless now. The ritual chant drove these worries from his mind and he lapsed smoothly into the flier's trance. He flew on and on, through a sky empty of clouds and Draks.

At last a portion of his mind that had been counting the miles and time with relentless accuracy, aroused him.

Swiftly he became aware of his surroundings. The flier still flew, the engine still pulsed, and the height indicator showed a good altitude. All was well.

The engine still ran, although the mental trigger that had stirred him was the ending of the time allotted for his fuel weight. But the engine still ran, no matter why.

Amarson looked down ahead of him. The red sun was covering the horizon below his wings, almost setting. Behind him the yellow sun was above the horizon again and following swiftly. It would pass overhead and meet the red sun, just as they both dipped below the horizon. The third passing of the Younger Sun was very swift and ended in the almost instant starless darkness that was the night.

Amarson strained his eyes and made out the low red shadow of the coast. It was there ahead of him, just on the limit of visibility. It was close, and the engine still ran. The Father Sun still watched over him. He might make the coast. He just might.

The engine sputtered and missed. Amarson glanced quickly at the fuel weight instruments. They showed nothing left. Next to them, the little tube with its fluttering vane still indicated fuel flowing to the engine.

Careless now of his fuel weight, Amarson ran the engine to combat power and pulled up in a steep climb. For a few heartbeats the flier responded, angling quickly up into the sky. Then the engine stopped. The fuel weight was gone.

Amarson dropped the nose and began his long drop back to the Mud Sea below him. His job now was to make that fall as long as possible. To make it last until he passed over the shore line. Now his life and honor flew along the narrow edge of a sword. A crash in the jungle on the mainland was a chance at life. A crash on the mud meant a sinking death.

He caressed the flier's controls, gliding it as shallowly as he dared. He had to keep it flying and that meant speed. A loss of flying speed now would mean a fall of several hundred feet. Altitude must be traded for distance, but smoothly, gently. He began to talk to the flier. He told it how to fly; held it in the air with his finertips and sang to it. The Rivermen had made a wonderful flier and it balanced through the air without a flaw. He did everything

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his skill taught him to lengthen his glide, but the coastline was still a long way off.

He hit the thermocline and fought his way through it with the flier right side up. The rough air gave him a little boost. The heavy air beneath it let him flatten the glide a little. The flier didn't sink so fast now.

Down here in the thick air he could see the wet shiny surface of the Mud Sea. It gleamed crimson in the light of the setting Father Sun. The mud was almost the same color as when he had flown out across it this morning.

Now he could see the shadow of his flier on the sea. The yellow sun was arcing above him on its way to meet with the red sun. The shadow flitted across the mud and gave him a different picture of his height. The instruments told him the figure, but the shadow pictured the true danger. He was very low.

The coast was nearer now. Close, but Amarson, using his flier's shadow as a guide, let his eyes follow the path of the flier. With skilled instinct he saw the slanting path through the air ahead of him. Here was the sword edge he envisioned, straight and true like Riverman metal with his life balanced on its edge. It pointed to the mud. The end was as certain as a Drak spear through the heart.

He kept on flying his shallow dive. Holding the flier off the wet mud as long as he could. Death would come when he hit the orange-red patch of sea up ahead, but not sooner. His honor held his life on the sword as long as possible.

The groundsman at sunrise had taken it for granted that his Baron would lead the flight home. What would the old fighter think when the flight came home without . . .

How many would come back? Amarson had seen two go down . . . and somewhere he had lost a wingman before he attacked the gas bag. Three gone; no, *four.* He smiled. He wasn't coming back either. The Riverman Ambassador would get his weapon evaluation from some other. The seven fliers in the tents would need some new pilots tomorrow.

"The fact that they are men gives them . . ." the old chief had said.

"The fact that *I* am a man let's me lead myself to death," Amarson growled. "Yet I'm going out like any cub, in an orange mud puddle.

"Well, I won't!" He yelled. "The mud is my enemy and the blood stains the hands!"

He began to chant a warrior battle song. His hands turned on the firing switches as he noticed four darts in the launcher racks.

"When I hit the mud I'll fire. The warrior will die in combat and so will the flier."

Suddenly he stopped talking to himself and sat rigid in the seat. Three times he had seen the orange spot ahead of him and each time it was closer. Now, as he looked, the yellow sun passed across the Father

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Sun and the light was all crimson on the sea.

The patch ahead didn't glisten.

"By the Father Sun, it looks dry," He was amazed. In fact he could see a wide strip of odd colored mud in the slanting light. "The mud must be shallow and dried out.

"Maybe I can land after all. The wheels won't roll. The mud couldn't be that dry. I'll have to crash, but the flier won't sink. If the mud is dry enough to hold the flier, I can walk on it." Suddenly the sword edge of death was a little wider. His honor held him on it, facing life again, standing firm with no thought of falling.

In quick jumping thoughts his mind planned the landing. The flier would be gliding, slow, but still too fast. He couldn't trust the wheels to roll. The best he could hope for was that the flier would not flip. If the wheels caught, the flier would flip over, burying him under it.

The flier was on top of the mud patch and the dry section was just ahead. No more time for plans.

He lifted the nose of the flier to slow it down and it fell out of the air. He felt it sink under him. Still too fast; got to kill the forward speed, or die! How?

His eye caught the arrowed points of the darts in the wing launchers.

"Eeagh!" A battle cry screamed out of his throat as he snatched at the trigger and fired all the darts.

The launchers gave a racking rattle. The recoil hit the slow moving flier and stopped it in the air. It hung nose up, then dropped straight down on its wheels in the mud. There was a ripping crackle and the wheel supports tore away. The body and lower wing slammed into the ground and came to a halt.

Amarson turned off his switches by reflex. There wasn't enough fuel in the flier to start any blaze, but his body was moving in trained reactions. He freed himself from the straps and climbed out on the wing. He crouched there and jerked his fighting knife out of its clips.

Then he froze as his reason took over. He had been about to run away from the wreck. That led out onto the mud. He stopped himself and didn't move. Out on the mud was death, if the mud wasn't dry.

He looked down at the wing, where it lay on the mud. It wasn't sinking. The mud was dry enough to support the flier. He turned to look out in front of the flier. There was a gleam in the yellow-red light. He saw the pattern of his fired darts sticking in the mud. They were standing upright, just as they had struck . . . and beyond them . . . a pile of solid rock and a point of land rising out of the mud. He laughed harshly. The sword of death had turned and he was standing on the flat of the blade. If the dry mud would hold the darts, it would hold him.

The color of the sky and the mud deepened suddenly to a dark red. He looked up in alarm. The Younger

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Sun had set and the red Father Sun was low on the horizon. In minutes it would be dark. There was no time to lose.

He gripped his knife tightly and stepped off the wing onto the mud. His feet sank into the surface, but it held him. Quickly, he began to walk toward the darts, then he broke into a run. The mud was dry, but not hard. If he walked, his feet sank. If he stood still, it might still suck him down. So he ran. He ran toward the rock and the point of land. The fight with his enemy, the mud, was not over yet.

He bent and plucked four of the darts out of the mud as he passed. These he would take back to the Riverman ambassador.

Riverman, he thought, *I'll spray your head myself for this day's work, then you can have these darts for a proper trophy, little man.*

The dart launcher was a great killer of Draks, but this last . . . Amarson had used these darts to save his life. He was going to give these darts to the Riverman as a trophy and the ambassador would take them proudly, with much water spray. His honor would let him hang these four life-saving darts in his house. That Riverman was quite a warrior in his own way. As good as the weapons he made.

The red light of the setting sun deepened and darkened as Amarson ran. The mud tugged at his legs and he stumbled and fell. His fighting claws slid out as he pulled himself up and stumbled on.

The red light was now so deep he could not see far. In seconds it would be dark.

He fell again, but this time his hands slammed against rock with a biting pain. Rock! He was on the point! On the land!

The Father Sun set and the perfect black night closed around him. He couldn't see, but he was on land. Free of the Mud Sea. He'd won.

Amarson pulled himself upright and raised his knife in the air. His voice cracked in a victory chant. Then the night's blackness folded around him . . . Blackness, and something else.

Six points of light flickered and danced off there to the left, down the coast. His chant roared in triumphant volume. That could only be a Jungle Patrol. The Draks didn't use lights. They didn't fly at night. It was a Patrol, safety in six men, and they would find him in the morning.

His skin tingled and he felt his thought swim away into the night. He was falling unconscious, but his last feeling was the shock of his shoulder and face hitting the hard rocky ground. The pain was a triumph. He had won his fight. He was on dry land. The Patrol was out there. He had driven his honor up on another sword edge. This time it was a sword of life and this time he would stay on its edge. The darkness would go away when the sun came up. ■

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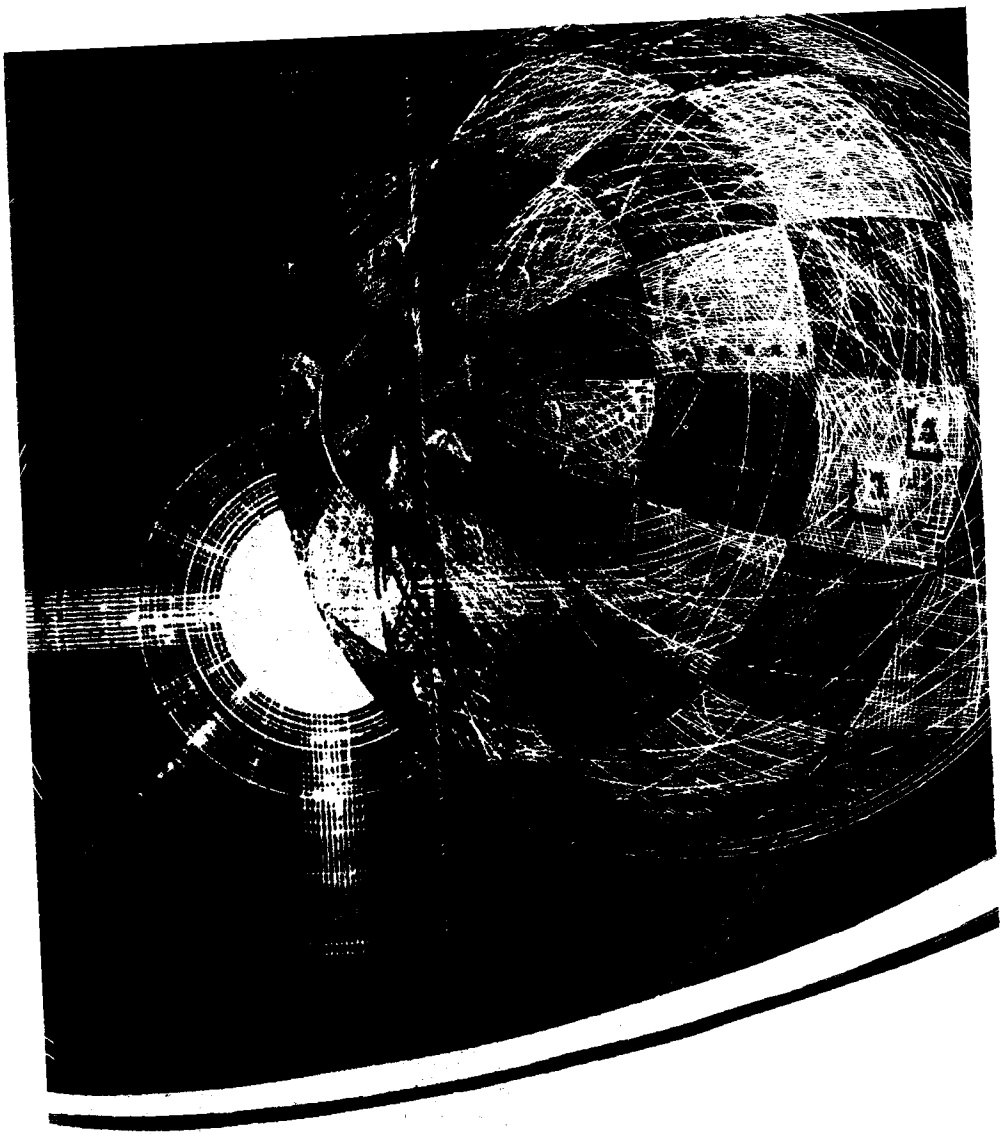

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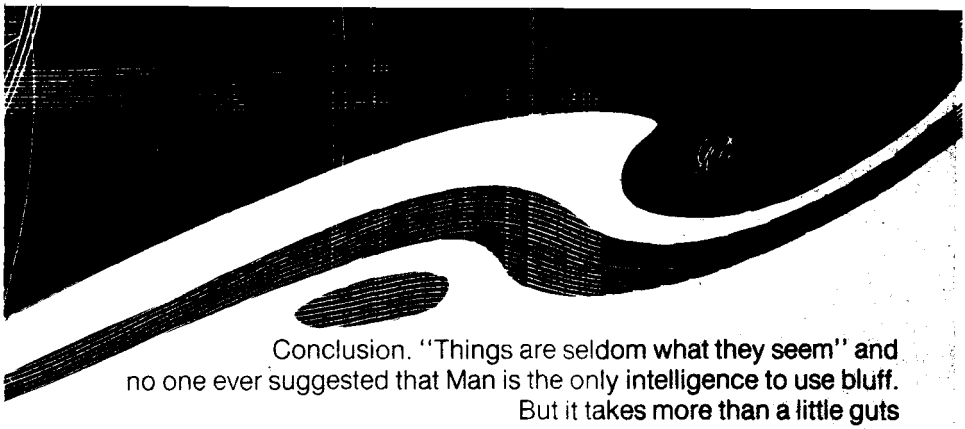

Conclusion. "Things are seldom what they seem" and no one ever suggested that Man is the only intelligence to use bluff. But it takes more than a little guts to try to outbluff a race of spacefaring pirates!

GORDON R. DICKSON

Illustrated by Kelly Freas

the outposter

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SYNOPSIS

The line of those cast out of Paradise is three miles long in the drizzling rain . . .

The castouts are Earth-born people who had been picked in a continuous lottery to be Colonists on the new worlds off-Earth, whether they want to or not. In that long line there is every conceivable variety of human being. JARL RAKKAL is a brilliant young giant, scion of an ancient banking family, who has made a personal fortune for himself in publishing. Only to be tripped up and chosen in the lottery as a result of strings pulled by his banking relatives, who have been scandalized by his flamboyant way of life. LILY BETAUGH is a midget and an ex-professor of Philosophy at the University of Belgrade. AGE HAMMERSCHOLD is a master cabinetmaker who is overage for protection by his union, from the lottery. MAURA VOLS, the widow of a starship position astrogator, has herself learned position navigation among the stars, as a hobby. But all of these are lined up with the other lottery losers on one side of a long fence.

On the fence's other side, which leads to a different boarding ladder rising to a different entrance lock on the starship, is ULLA SHOWELL, daughter of Admiral-General JAS SHOWELL of Blue I Fleet, stationed at the Outer Navy Base in the area of the Colony planets toward which they are all headed. Ulla is arguing with the ship guards about wearing the regulation navy side arm that is required for passengers. Watching, is Apprentice Outposter Mark Ten Roos, just graduated from the Outposter Academy which supplies experts to live with, direct and protect the unwilling Colonists. He is returning hastily now to the Outposter station where he was brought up. His foster father has been badly crippled by a raid of aliens upon the Outpost and the Colony it protects. Mark sees that one of the guards talking with Ulla is arguing himself into trouble. To create a diversion that will rescue the man, Mark deliberately provokes Jarl Rakkal, on the other side of the long fence.

Rakkal charges the fence, manages to get over it and attacks Mark with the skill of a man trained in ki-*fighting—a school of unarmed combat. Mark, however, counters the* ki-*stroke with his own trained reactions, knocking Jarl out. Jarl is carried aboard, the guard is rescued, but Ulla Showell is left stunned by the event; and particularly so by the guard's refusal to take the unconscious Jarl to any place on the ship but the Colonists' hold.*

The spaceship loads and lifts. In the dining lounge, the first day out, Ulla Showell meets Mark and apologizes for not understanding that Mark had actually saved Jarl's life. If Mark had not knocked the big Colonist out, the guards would undoubtedly have shot him. She invites Mark to join her at the captain's table. He does so, but a Meda V'Dan appears, one of the race of aliens who raid the Outposts and

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the Colonies, and whose depredations are winked at by the human Space Navy high command. Mark insults the alien, who complains to the ship's captain.

The captain is about to put Mark under arrest when a couple of veteran Outposters who are also in the dining room interfere. Mark is allowed to go free, but he is warned by the senior Outposter veteran against causing trouble he cannot handle on his own.

Outside the dining room, Ulla joins Mark and he tells her the reason for his reaction to the alien. The Meda V'Dan raided an Outposter station and killed his father and mother when he was a baby. He has been brought up as the foster son of an Outposter named BROT HALLIDAY. Ulla admits that she wants Mark, who as an Outposter has the right to visit the Colonists' quarters on the ship and she has not, to take her in to see Jarl Rakkal.

Mark does so—taking her along on a survey of the Colonists to see if there are any with special skills that would be useful at Brot Halliday's station—but the price he exacts is that Ulla use her influence with her Admiral-General father to lease to Mark four overage, small, Navy spaceships, ostensibly as scarecrows to keep the alien Meda V'Dan raiders away. Later, at the station when the Colonists arrive whom he has picked—including Jarl Rakkal, Maura Vols, Age Hammerschold and Lily Betaugh—he puts Jarl in charge of the station's economy, Maura in charge of training spatial navigations, and rounds up Colonists to whom he offers a chance to actually crewing the Navy ships.

For the first time he admits that he intends to use the ships to deal with the Meda V'Dan, if necessary.

He has just got these people to begin the study and work that will put the ships into space, when there is an urgent call from Brot—now a cripple in bed following a Meda V'Dan raid on the station that had been the cause of Mark's being summoned out to the station. Brot has wanted Mark to take over as Station Commander. Now, his call indicates that an Outposter named Stein—who was formerly Brot's second-in-command and ordinarily would have taken over the station instead of Mark—is with him.

Mark is jarred. Stein had quit and left the station when Mark arrived. Now the three other Outposters at the station admit that they invited Stein back, hoping what he saw would change his mind. Evidently it has not—and Stein is alone with Brot in the Residency.

Mark sets the vehicle he has been riding in motion, swinging it swiftly about on the grass and sending it sliding toward the Residency, only a few hundred yards away.

It is, in fact Stein. He threatens to go to Outposter HQ with word of what Mark is doing to man the four navy ships unless Mark and Brot both give way to him. Mark has no choice but to push matters to a gunfight between himself and the older, more ex-

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perienced Outposter. Mark has been a Medal Winner at the Outposter Academy, but he has never actually fired on a man before. He tries to wound Stein only, but ends in killing the other man; and being wounded himself.

He is some little time recovering. By the time he is up and around, however, the ships are ready to lift. Jarl Rakkal has uncovered some individual carvings by the Colonists which might be a medium of trade to the Meda V'Dan; who theoretically could trade them on as object d'art to other alien races farther in toward to center of the galaxy. With his four ships and a small cargo of the carvings, Mark pays a visit to the capital world of the Meda V'Dan. While waiting for a chance to talk to the Most Important Person of the aliens, he makes an opportunity to explore the alien building in which he—with Lily, Maura Vols and others—is waiting for audience—something no human has ever done before. He finds the structure has something like a large warehouse section in its lower floors, with a great deal of empty space and apparently few aliens about.

The Most Important Person of the Meda V'Dan finally grants them an audience. Mark accomplishes a trade of the carvings for Meda V'Dan weapons by threatening to bypass the Meda V'Dan and take the trade directly to the other alien races farther in toward the galaxy's center. The Meda V'Dan pretend to laugh at this—but give in.

Returning to their home Colony and station, Mark finds Ulla Showell has arrived on a visit to see Jarl Rakkal. He tells her grimly that it is a bad time; and explains to her—as he explains to his fellow Outposters and Colony heads—that a Meda V'Dan raid can be expected shortly. Undoubtedly the Meda V'Dan wasted no time in checking on their four ships with Navy Base; and by this time Navy Base will have told them that the ships are crewed and their weapons manned by Colonists—not trained Space Navy men. Therefore, the Meda V'Dan will expect that they can raid the station quite safely and not only recover the weapons they had traded to Mark, but whatever face they had lost in being talked into such a trade.

Just as Mark says, the aliens do attack the station and the Colony. With the Colonists on his four ships, Mark drives them off. Afterwards, however, Ulla questions him about a strangely bitter statement he has made earlier.

". . . That business you mentioned about how people treat their leaders," she says. "That business about how one day they'll hang you high in the sun, when they're through with you—to teach others that a people are not easy to serve. Do you really think something like that might happen to you, someday?"

He looks at her for a while before answering.

"I don't just think it might," he says. "I know it will."

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Part 3

XIII

"There's a way around it," said Mark.

He sat drinking crushed rum cocktails with Admiral-General Jaseth Showell in the wide, softly carpeted living room of Showell's suite at Navy Base HQ. Ulla was across the room. A ten-by-twelve foot sealed window gave a view of the square miles of airless space occupied by the ranked spaceships, docks, barracks, administrative, and hospital structures that made up Outer Navy Base. The light of the GA star which Navy slang had nicknamed "Murgatroyd's Onion," shone unchangeably upon this multitude of metal bodies, the larger ones with checkerboard hulls of alternate silver and black squares.

"You and I know," Mark went on, "that they're liable to distort things back at the Earth-city because they don't understand what it's like out here."

"Yes," murmured Jaseth. The little, gray-headed man was watching Mark with the polite but unwinking interest of a robin examining a working mound of soft ground that might at any moment reveal a worm.

"Nobody could be more pleased than we are—my foster father and I," said Mark, "by the flattering attention we've been getting back in the Earth-city since we captured those Meda V'Dan renegades. I ought to include the way the other Outposters at the station feel about that—I might even throw in our Colonists, too. They've really had a shot in the arm. Production's way up. And, of course, that's what we're all out here for—to get production up and our Colonies standing on their own feet."

"Of course," said Jaseth, nodding.

"But, nice as it is," said Mark, "I mean, the praise from Earth, the attention, even the reparations the Meda V'Dan were so generous as to pay when we handed back the renegades and their two ships—there's a drawback to it all. It puts Abruzzi XIV a little too much in the spotlight. We're working hard to improve things so this Colony of ours can stand on its own feet; but production or crop failures, or any of a dozen things can always trip us up. And if something like that does, there're people back on Earth in Government who may blame it on the fact this business of driving off the renegade Meda V'Dan has gone to our heads."

"Always possible, yes," said Jaseth.

"But there could be an answer to it, that'd also be an answer to these people back in the Earth-city who don't seem to understand how we happened to have four small Navy ships without Navy men to man them," Mark said. "In fact, it's the sort of answer that could solve all our problems, past and future."

"And future?" said Jaseth.

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"You know," said Mark, shrugging. "It's simply a matter of your telling Navy HQ back on Earth that your letting us have the four ships was part of a quiet experiment on your part in furthering the self-sufficiency of Colonies like ours. After all, that's essentially what it was. You might even ask permission to extend the experiment by making more ships available to us and other Colonies. Not only would it look good, but it would reduce the pressure on your own duty ships to protect against Meda V'Dan renegades."

"More ships and weapons?" Jaseth shook his head slowly. "No, I don't think so. But your other suggestion isn't bad. I think—"

"It'd be useless without some concrete new evidence to back it up," Mark said. "After all, Abruzzi XIV probably invited retaliation from other renegade Meda V'Dan because of the way we treated those three ships. It wouldn't do to have us hit again, and this time be wiped out for lack of the necessary defensive equipment. Also, it'd look unnatural if, your experiment having worked, you didn't continue to push it forward vigorously. Above all, we just might find ourselves being visited by some news people from Earth; and the sight of recently arrived equipment and military supplies would go a long way toward filling in any gaps there might be in the memories of my people, about your intention to help from the very start."

"Of course," said Jaseth, frowning at his cocktail glass, "Earth HQ might not approve—"

"They can't hardly avoid approving, can they?" Mark said. "With all this publicity—which goes a long way in answering some of the Navy's Government critics who've been complaining about inactivity at the Base, here?"

"But then," said Jaseth, glancing over at Ulla, who with her own cocktail glass, was sitting silently apart, listening, "there's that matter of your going to a home world of the Meda V'Dan the way you did, almost inviting a raid."

"I don't find anything in law or Colony Regulations against it," said Mark. "And, of course, we've been assured by your Navy people for years that the Meda V'Dan are completely peaceful and friendly—with the exception, of course, of occasional renegades."

"Nonetheless," said Jaseth. "You were undoubtedly aware that you were taking a risk."

"Oh, certainly," said Mark. "We might have run into renegades on the way there, for example. Luckily, however, we made it safely and even set up a profitable trade pact with the peaceful authorities of the Meda V'Dan—a pact we'll have to carry through, now, naturally, if we don't want to offend them. But you're right about all this attracting more attention from renegades. Come to think of it, that makes it all the more important that our Colony gets more

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ships, and larger ones, as soon as possible. I'm indebted to you for pointing it out."

"I don't believe I did. It was your conclusion," said Jaseth, mildly. He put his glass down on the low table between their chairs. "Still, I'll have to think this matter over. How about it? Shall we go to dinner, now?"

The three of them got up and went into the adjoining dining room, talking about other things. Ulla took part easily in this conversation. She had come here with Mark, five days before; and already intimated that she would be going back with him to Abruzzi station. Since that first morning before the raid, she had talked no more to him about marrying Jarl. Mark did not know whether what he had said to her had got through to her or not. But she had been undeniably helpful to him here at the Base, in his dealings with her father and other Navy officers. Only, he caught her watching him at odd times, as if she was secretly observing him.

He had not said anything more to her about anything important. There was no apparent need—and besides, he had been left with the slightly uncomfortable feeling that he had said too much the one time he had opened up to her; though there was nothing he could remember saying that justified the feeling. Still, he was left with a vague uneasiness that if he started to talk to her again on matters important to him, his tongue might run away with him once more.

The other dinner guests—some twenty Base officers, a few wives and a couple of important salesmen—stood and applauded briefly, Navy fashion, as their host, his daughter, and the guest of honor entered. Jaseth took the head of the long, narrow table, seating Mark on his right and Ulla on his left. On the other side of Mark was a general of Marines whom Mark had met two days before at the cocktail party that had celebrated Mark's arrival.

"Hear you're leaving at the end of the week," the Marine general said to Mark.

"That's right." Mark nodded.

"Too bad." The general was a tall man in his late twenties, already running to fat. "If you could just wait around until the first of next week we could start hosting you all over again when Maraki—Admiral-General of the Red—starts his tour at the Base and Jaseth, here, goes home." The general looked across at Jaseth. "How about it, Jaseth? Talk Mark into staying into next week, will you?"

"Doubt if I could," Jaseth said.

"No," grumbled the Marine general, cheerfully, "because you don't care enough. You're headed home. How about the rest of us who have to stay here?"

"Don't let it prey on you, Johnny," said Jaseth. "You've only got four months to go before you'll be headed home, too."

"Four months! Three-quarters of

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a tour of duty! Jaseth, you talk like it was three days!"

Jaseth laughed and turned to talk to Ulla.

"He doesn't care," said Johnny, leaning confidentially close to Mark, and nodding at Jaseth. "I won't either, when I get to be General-Admiral. Meanwhile, it's nothing but duty, duty, duty—double duty, thanks to you and your Meda V'Dan, damn it."

"Thanks to me?" Mark asked. Johnny had been making the acquaintance of more than one rum crush during the before-dinner hour, and his breath was heavy at this conspiratorial distance.

"Thanks to the fuss back at Earth-city you kicked up by nailing a couple of renegade ships," he said. "Now we've got patrol exercises. Patrol exercises! Can you imagine a bunch—any bunch of Em Veedee renegades with the guts to hit a Navy wing on *patrol?* They learned better than that, forty years ago. Besides—shouldn't tell you this. Restricted information, but hell, you're on our side—we've already sent a confidential word to the Em Veedee authorities telling them there's a real stink being kicked up by that raid on you; and for once they've got to sit on their renegades for a while."

"What do you think?" said Mark. "Do you think the Meda V'Dan authorities will do it?"

"Why, hell yes!" muttered Johnny. He lowered his voice still further. "You know as well as I do—that's a lot of whatever-you-want-to-call-it, their not being able to hold down their renegades when they want to. We know that. They know we know it. And usually we get along just fine. Hell, nobody minds a few stations being hit from time to time—say a couple a month. That's all in the statistics. No offense—I know you're an Outposter, yourself. But you've had a good Earth-city education. You know we can't go to war over a few casualties a week. You understand that."

"I've seen it," said Mark.

"There. Said you'd understand. What I say myself—let the aliens nibble a bit from time to time, and they won't get hungry enough to take a big bite. But at the same time—hell, if they make a mistake and a lot of fuss is made about one of their raids, then they've got to play ball with us until things calm down again. That's just common sense. Right?"

"Right," said Mark.

"And those Em Veedees have got it—common sense I mean," said Johnny, "where it comes to looking after their own interest. They may be aliens, but they've got common sense. Do you want to hand down the wine bottle there? Seems like I'm empty here again."

Mark passed the bottle.

He spent another five days mainly in attending day and evening social occasions at the Base. He said no more to Jaseth, however, about the added ships for which he had asked.

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But on the evening of the sixth day—just before the morning on which he was to return to Earth until his next tour of duty as Base Commanding Officer, six months hence—Jaseth drew Mark aside during a small party in the Officers Club.

"I'd thought Ulla might want to go back to Earth with me when I go," the older man said. "But it seems she wants to stay out here at your station. That worries me a little. After all, you've already been raided once."

"I don't think we'll be raided again," said Mark.

"But," said Jaseth, "you've asked me for these ships—"

"I asked for the ships with the general situation in mind," said Mark, meeting the older man's eyes. "Ulla's staying is a specific matter."

"Ah . . . she hasn't told me exactly what the attraction is there," said Jaseth. For a moment the older-man seemed genuinely unsure and concerned. "It wouldn't be that you well—"

"I think a good deal of Ulla," said Mark.

"Oh? I see. Well," Jaseth's voice was relieved, "you'll be glad to hear I've finally decided to let you have the ships and materials you asked for—"

"And cadre personnel to train my Colonists in handling them?" said Mark.

"Cadre?" Jaseth looked sharply at him. "Oh, no. Not that. I can explain ships, back on Earth. I can explain that this was a secret project of mine and that's why you didn't admit to it sooner. I can justify more ships and any amount of supplies you want. But navy personnel—no. HW's not going to have any objection to your Colonists making themselves useful—but it's the Navy keeps the peace, here in outer space. The Navy, and no one else!"

"The ships'll have to do, then," said Mark. "I want regulation cruiser class vessels, mass eighty—twelve of them."

"Twelve? A Wing and a half?" Jaseth stared. "You can't crew that many. Not if half your Colonists were rated spacemen!"

"I'll take them anyway," said Mark. They looked at each other. "If I did, without asking you, it'd be six months before you even noticed they were gone from this Base."

Slowly, Jaseth nodded.

"I'll make out the orders tonight," he said. "You can start moving them out tomorrow—with your own crews and officers."

"That's why I brought along three scoutships when I came," Mark said. "I've got my navigator, and enough people to life the extra ships and set them down on Garnera IV—and that's all it takes."

Two days later, however, when the twelve heavy vessels and the three scouts were back in space and well away from observation on the scan cubes of Navy Base, Mark called Maura Vols into the command area from the spacious room she now oc-

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cupied as Navigator and Position Officer in the cruiser Mark had chosen to use as flagship.

"We'll change arrival point," he told her. "From Garnera IV to destination code T."

Ulla, who was with him in the command area, looked about sharply at his words.

"The whole Wing?" Maura asked. She had become crisp and self-assured; and she no longer recalculated several times before ordering a position shift.

"The Wing and the scouts—all of us," said Mark. Ulla came over as Maura turned and went out of the room.

"Code T?" Ulla asked. "What's that? Or shouldn't I ask?"

"When I went to see the Meda V'Dan," Mark said, "I agreed to a trading deal with them involving sixty-seven pieces of handicraft made by my Colonists. Code T is the space point where we were to meet them to exchange goods."

She looked startled.

"You think they'll be there—after what you did to those three alien ships that tried to raid Abruzzi station?"

"Absolutely," said Mark. "One of the main principles of the Meda V'Dan is that there's no connection or responsibility between separate acts by different individuals. The ones we'll meet are going to act as if they never heard of the three ships that tried to raid Abruzzi XIV—and all we have to do is do the same."

"Even when you show up with twelve full cruisers?"

"We won't show up with twelve—all at once," said Mark. "We'll move in just one ship to begin with and then add others."

It was exactly what they did. When they came to the edge of the cruisers scan cube range, Mark paused to locate the Meda V'Dan. They were discovered, after a six-hour search—three mass thirty-six ships, only slightly smaller than Mark's cruisers, waiting for contact. Three such ships were several times the strength needed to handle four heavy scouts such as Abruzzi station had proved to have during the raid; and the addition of a single mass forty cruiser to reinforce the scouts still left the Meda V'Dan ships with a comfortable edge in weapons and armor, for any spatial confrontation.

Therefore, the three alien ships showed no alarm when Mark's cruiser appeared alone on a short shift to within talk-beam range.

"Meda V'Dan," said Mark, when the beam was stabilized, "this is Outposter Station Commander Mark Ten Roos with the pieces of art we agreed to trade you. Do you have the flame handguns you agreed to trade us in exchange?"

There was a moment's pause, filled by the hiss and crackle of minor interference, for the talk beam was close to its extreme range. Then a heavy-voiced Meda V'Dan answered.

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[I am the Lord and Great Captain Fateful Dreaming Man] it answered. [I and my two brother Lords and Great Captains bring you the finest of handweapons for that which you bring us in exchange. But if your trade items are in any way deficient, take warning. You will be charged proportionately for whatever value you have attempted to cheat us by.]

"I can't object to that," said Mark. "So, I'll just give you the same warning, and charge you the same way, if your weapons strike me as being deficient in value."

[Do not be presumptuous,] retorted the voice of Fateful Dreaming Man. [It is for us to judge the bargain and you to be judged—]

The Meda V'Dan's voice broke off abruptly. Two more of Mark's cruisers had shifted into positions flanking the row of Meda V'Dan ships.

"Forgive me if what I said sounded like presumption," said Mark. "I only meant to suggest that everything ought to be equal. Certainly you agree to that?"

Three more ex-Navy cruisers appeared together behind the Meda V'Dan ships.

There was silence from the speaker jacked into the talk-beam receiver aboard Mark's cruiser. It lasted for the tense space of perhaps two minutes while the skeleton crews aboard the human vessels counted the seconds one by one.

[I will accept your explanation,] rattled the speaker, suddenly. [You may board the center of our three vessels with three individuals bearing your trade items.]

"No," said Mark. "You can board my first vessel to appear here with one individual, after you've floated the containers of your handweapons across to us and we've inspected them. And unless the Lord and Great Captain Fateful Dreaming Man doesn't care to risk himself personally, I suggest he be the individual."

[The Lord and Great Captain Fateful Dreaming Man,] retorted the speaker immediately, [is beyond and above and unknowing of risk. But he receives guests in courtesy and visits only in courtesy. Let him be received in courtesy, and Fateful Dreaming Man will enter your ship either alone or in company.]

"We're courteous," said Mark. "We're always courteous to our good friends, the Meda V'Dan."

[I will come.]

Fateful Dreaming Man was as good as his promise, once Mark had examined the flame weapons and found them all new and in good order. The Meda V'Dan captain rode across from his ship to Mark's cruiser in a one-man safety boat; and accepted the box containing the small, carved elephants from Mark's hands. He opened the box and examined them, carefully and individually; then put them all back into the box. An agreement was made for another trade in four weeks.

[We are agreed,] he said. [I will go back to my ship.]

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"Just one thing," said Mark. The alien waited. "I want you to carry a message for me back to the Meda V'Dan. The ships of our Navy are going to be in space more in the near future than they have been for some years. Tell your people not to worry about any renegade Meda V'Dan who might make the mistake of attacking these Navy ships. Such renegades will have me to deal with—and I'll follow them anywhere I have to, to take care of them. Will you remember to tell your people that?"

Fateful Dreaming Man glanced across the cruiser control area to the scan cube in which the light of his three ships burned, surrounded by the lights of Mark's six larger vessels.

"I will remember," the Meda V'Dan said. "And tell them."

"Good," said Mark. "So will I. And just to make sure, I'll be reminding your people each time they come to trade with me."

The Meda V'Dan left. Mark turned to Maura Vols.

"Home," he ordered.

XIV

When they landed back at Abruzzi station with four of the big cruisers—the other eight having been dispersed in wooded areas of the station where they would be hidden—there was a fine-boned, gray-haired man, slightly taller but much more frail-looking than Jaseth Showell, among those waiting to welcome them. This man sought out Mark among those leaving the flagship vessel.

"Mark!" he said, reaching out both hands to take Mark's arms like someone whose eyesight is no longer reliable.

"Wilkes," said Mark—and found himself smiling at the older man. He turned to Ulla.

"Ulla, this is my Earthside tutor, Wilkes Danielson," he said. "Wilkes, this is Ulla Showell."

"How do you do, Miss Showell—how do you do?" said Wilkes, letting go of Mark to shake hands warmly with Ulla. He turned back to Mark. "Forgive me—"

"For showing up here?" asked Mark. "I've been expecting you."

"Expecting me?" said Wilkes, in a tone of delight. He fell into step with Mark and Ulla as they moved to a waiting ground car and climbed in, with Mark behind the controls. Ulla took a seat in the back and motioned Wilkes to sit beside Mark, which he did.

"You used to climb mountains," Mark said. "Remember telling me about that?"

"Yes. Yes, of course—you're right," said Wilkes. "But I'm an old man now—or I thought I was an old man until I guessed what you were up to out here."

Mark swung the ground car about and headed toward the Residency.

"What am I up to?" he asked.

"You're making a revolution, of course!" said Wilkes. "I should have guessed it even before I read about

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your station driving off a Meda V'Dan ship and capturing two others. No other Outpost station or Colony's ever done anything like that; and yours couldn't have done it unless it had weapons no Outpost station's ever had."

"It's time for a change," said Mark.

"Of course," said Wilkes. "And I should have seen it before you. I was the anthropologist, the sociologist. But then you're the one who's making it change, Mark—and that's the difference."

"So you came out to watch?" asked Mark, pulling the car to a halt before the Residency entrance.

"I came out to help. I had to pull all kinds of strings. But if a year or two is all the time I've got left, at least I can do something with it, this way. You can use me, can't you, Mark?"

"Always," said Mark. "You and Brot are part of everything I do."

He got out of the car and waited while Wilkes and Ulla also got out. They started in to the Residency.

"I've got to go and talk to Brot, first," Mark said, as they went through the door. "You don't mind waiting fifteen or twenty minutes, do you, Wilkes? Then I'll be free."

"Don't worry," said Ulla, unexpectedly. "I'll entertain Mr. Danielson. There's a lot I want to ask him." She took the fragile, older man by an arm. "We can have some coffee in the downstairs lounge here."

She led Wilkes off through a doorway to their right. Mark continued on to the entrance to Brot's room and found his adoptive father sitting up behind a desk in a power chair.

"How'd it go?" Brot asked, as Mark entered the room.

"Twelve ships," said Mark. "All cruiser mass forty. And the trade went off as scheduled with the Meda V'Dan. How's it been back here?"

"Busy," growled Brot. "I'll say one thing for that Jarl—he doesn't sit around. And now that tutor of yours showing up here in the middle of everything."

"Wilkes is a walking library," said Mark, quietly, sitting down in a chair opposite the desk. "And he's got true genius-level intelligence. Did he rub you the wrong way?"

"No," said Brot. "He's all right. But he's nothing but a bag of bones."

"He's dying," said Mark. "Sickle-cell anemia."

"I knew that eight years ago, when I messaged him asking him to take you on for tutoring," said Brot. "But he looks like he won't last the week, now. A sneeze'd tear him apart."

"He'll last—long enough," said Mark. He looked at Brot. "How about you?"

"Me?" Brot snorted. "I'll make a hundred and thirty, or blow my own brains out! You aren't classing me with someone like that?"

Mark smiled, for the second time in one day—in fact, he realized, the

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second time since getting off the cruiser.

"I've never classed you with anyone," Mark said. "You're all by yourself, Brot."

"Too damn right. What's next in the plans?"

"Work." Mark's smile vanished. "We've got perhaps three months to train Colonists to handle all twelve of those ships, at least under certain specific, simple conditions. At the end of that time, I want to hold a meeting here of all the Outpost stationmasters you think would be able to work with us without fighting—either us, or each other."

"I'll make a list," said Brot. "What else?"

"Minor things," said Mark. They talked a while longer about those minor things; before Mark excused himself to get back to his reunion with Wilkes.

In the weeks that followed, Mark's former tutor fitted effectively and powerfully into the team Mark had set up with Lily Betaugh to deduce the philosophy and psychology of the Meda V'Dan. Wilkes also was unexpectedly useful in that he swept up Ulla to work as his assistant. This settled an inner question Mark had been avoiding with some difficulty—which was what the daughter of Admiral-General Showell was doing, making an apparently unlimited stay at Abruzzi XIV station. Ulla had been useful before this as a companion to Brot. But, except for the lack of the parts of his limbs that had been amputated, the burly ex-Station Commander—for Mark had been confirmed in that post following the publicity about the Meda V'Dan raid—was now so stubbornly recovered that it was ridiculous to pretend he needed someone hovering about him.

But Ulla, it turned out after Wilkes had put her actively to work—had other uses as well. She was able to give Mark a rough, but effective, idea of where the Navy patrols would be conducting their sweeps in the neighborhood of the Colony Worlds they were supposed to protect. From this, working with Maura Vols, Mark was able to make an intelligent guess at which patrol the Meda V'Dan might hit, if they chose to attack any part of the Navy.

"But what I can't see," protested Ulla, some nine weeks later, "is why you think they're liable to attack Navy ships at all. They never have—not since the early days of the Colonies, when the Navy was first set up; and even the Navy used to say those attacks were more than likely mistakes. Once the Base was fully operational, no Meda V'Dan ships ever looked twice at a Navy vessel."

"They may now," said Mark, briefly.

"But why?" Ulla insisted. "I know, every time the station trades with Meda V'Dan you warn the aliens to leave the Navy alone. But why would they *want* to do anything?"

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"To find out how much strength we have, here at Abruzzi XIV," said Mark, at last.

She shook her head, denyingly.

"Then, that means every time you warn them, you're essentially daring them to do something to a Navy patrol," she said. "Isn't that right?"

"Yes," said Mark. He discovered his jaw was set so hard that the muscles ached.

"But the Colonists you're training aren't anywhere near ready to fight their ships, let alone in a space battle."

"Give them another month," said Mark, "and they'll be good enough—for my purposes."

He turned and left her. He found himself torn, these days, between the desire to seek her out and the desire to avoid her. The end result was that he buried himself in work as much as possible; and with one exception, no one at Abruzzi XIV came close to matching the hours he put in.

That exception was Jarl Rakkal. There was a relentlessness in the way the big man attacked any problem; but it was a smooth, efficient relentlessness that never seemed to exhaust its possessor. Four hours sleep a night were evidently sufficient for him; and during the remaining hours he did not let up for a second.

He made plans; then went to the place where the plans were being executed and stood over whoever was concerned with executing them until they were done to his satisfaction. He had not exaggerated to Mark his ability to handle people. He had shaken up both the agricultural and manufacturing teams of the Colony and got them to producing at three times their former rate. He had even put Age Hammerschold in charge of the furniture factory and talked at the old man until Age stopped his muttering to himself, perked up and took command of work there.

Jarl was still technically a Colonist, but by sheer capability and effort he had raised himself in importance to the community, until now, with one exception, he was the most important man after Mark at Abruzzi XIV. He was like a river in flood, moving everything he encountered; so that by the end of four months after he had arrived, everyone—again except for a single person—gave way to him without argument.

The exception was Brot. Against the rock that was the ex-Station Commander, the powerful waters of Jarl's will broke and divided.

"You're a smooth operator," Brot had told him bluntly the first day they had met. "And I don't like smooth operators. Stay out of my way and there'll be no trouble."

Jarl had refused to give up in the case of everyone else who had resisted him. But after that first encounter with Brot he had never tried again to influence, or compete with, the older man. Instead he had, as Brot advised, stayed out of Brot's way. And there had been no trouble.

In a way, it was a compliment to

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Brot's innate strength that Jarl paid to no one else—not even to Mark. The big man was a strange case, from Mark's point of view. Mark told himself that if Jarl had possessed even the slightest spark of honest feeling, it would have been impossible not to have liked him. But there was no spark. There was nothing. Jarl's concern began and ended with himself. He was without fear, brilliant, imaginative, resourceful—but within him that which should have been warm and responsive with instinctive emotion was cold and dead as some stony fossil.

Jarl recognized this in himself, obviously; because he was not shy of making comparisons between Mark and himself.

"You know," he said one day, when they had finished going over the Colony's books, together, "I ought to be the one to change history, not you."

Mark looked at him across the coffee pot they were sharing.

"Want to try?" Mark asked.

Jarl laughed.

"Not with hands or guns, or anything like that," he said. "But in other ways, I'm so much the better man than you—and still, there you are out in point position for the forward march of mankind; and here I am in line behind you. And I don't have any weaknesses."

Mark drank his coffee without comment.

"What about Ulla?" asked Jarl, unexpectedly.

"What about her?" Mark shot back.

"She came here for me," said Jarl, smiling.

"You don't want her," Mark answered.

Jarl's eyebrows went up.

"Not want Ulla? The Admiral-General's daughter?" he said. "Of course I do."

"No." Mark shook his head and put his cup down. "When you first came here she might have been some help to you. You don't need her now—you're already on your way back up. So you don't want her, really."

Jarl's eyebrows came down.

"You might be right," he said. "I've got my teeth into something, here. Which doesn't alter the fact Ulla's changed now. She wants you."

Mark's jaw tightened grimly.

"I don't know she does," he said. "But in any case—no one's going to have me."

"Still planning on dying?" Jarl considered him with a frankness as brutal as his insight was penetrating. "Excuse me. I mean, still planning on being killed? What if people don't oblige you?"

Mark shoved the coffee pot and the cups to one side.

"Let's see those performance records for the spaceship trainees," he said.

"Come to think of it," said Jarl, without moving immediately, "maybe that's what it is; why you're out there in front and I'm not. You're going some place—to your

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own execution. That's why I can't beat you out. You're a moving target. If you ever stood still, I'd pass you up automatically."

"Performance records," said Mark, pointing toward the spool file drawers.

"Coming up," said Jarl, turning to get them. He got out the proper spool, snapped it into the desktop viewer and together they bent to a study of how the training of Colonists to man the Navy ships was progressing.

But even the fact, that the records finally showed the trainees competent to execute the few simple ship maneuvers Mark required of them, was not able to wash Jarl's words out of his brain. They clung there, as Jarl's words had a tendency to do, like the barbed spines of a sand burr in the skin; and they rankled. Until Mark finally decided that it was time to make Ulla understand about him.

He came to this conclusion while returning to the Residency unexpectedly early one day, hot and dusty from a swing by ground car around all the agricultural sections of the station. The crops were excellent this year, again thanks to Jarl. They would have more than enough to feed the Colony during the winter whose beginning was now less than three months off. But just because the harvest was good, it posed a problem. Normally, everyone in the Colony who was able to work, was recruited to get the crops in. But this year he had nearly a fourth of his available work force tied up in those being trained to operate, navigate and fight the ex-Navy spaceships. If he took them off that training and sent them out to the fields scattered all over the station, there could be no way of getting the ships manned again swiftly in case of necessity.

And there still had been no sign of Meda V'Dan activity against the Navy. The trading ships of the aliens came right to the station nowadays, in ever-increasing numbers to trade. The Meda V'Dan had never seemed so peaceful and cooperative. And every twenty-four hours one of the heavy scoutships relieved another, out on station by the patrol route Mark, Maura and Ulla had decided was the most likely area for an alien attack on the Navy. Steadily the returning scoutships reported no sign of alien activity.

Mark, therefore, had been puzzling his problem all day—whether to risk taking the trainees out of the cruisers for harvesting, or not—and finding Ulla's face intruding on his thoughts in spite of everything he could do. In exasperation he had decided that if he could not solve one problem, at least he would solve the other—and headed back toward the Residency.

As he came in through the Residency front door on to the soft carpet of the entrance hall, he heard from beyond the door that led to

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Brot's room the soft murmur of voices, one of them Ulla's.

As he walked toward the door, his boots noiseless on the carpet, he recognized the other two voices. One was, of course, Brot's. The other was the voice of Wilkes. Less than a pace from the door, Mark checked. For he could understand now what the voices were saying and they were talking about him.

". . . But that's just what I've asked him, a number of times," Ulla was saying. "Why?"

"Damn idiot," rumbled Brot's voice.

"No." It was Wilkes speaking. "In a way, it's my fault. I'd never had a pupil like him. And I had no family. I was like a father who dreams about his son following in his footsteps, but being better at it than any man in history. I talked to Mark constantly. I talked too much. I not only filled him up with what he needed to know; but I tried to fill him up with everything I knew, too."

"The hell!" said Brot. "He didn't have to listen, did he? Why wasn't he outside swimming, or skiing, or running around with girls?"

"Because he wasn't an ordinary boy," said Wilkes. "He was a very extraordinary boy—not only because of the mind he had, but because the Meda V'Dan had killed his parents and he'd spent his first thirteen years here with you, Brot."

"What did I do?" growled Brot.

"The same thing I did—only in a different direction," Wilkes said. "I tried to make him all scholar. You tried to make him all Outposter. And we both succeeded—too well. With an ordinary boy it might not have done him any harm. But Mark was too capable of learning. He was a finished Outposter at thirteen; and a finished scholar at eighteen—and better at being both than either of the men who taught him. You gave him the desire to clean up this Colony situation; I gave him the means—the knowledge and theory to work with. Out of both these things, he's come up with a plan he won't tell us about—except for two things. That it means the end of the Meda V'Dan—and it means his own end, too—at the hands of the people he'll save from the Meda V'Dan."

"All right," said Brot. "We've got to stop him—that's all."

"Can you stop him from going after the Meda V'Dan?" asked Wilkes, quietly.

"Hell, no! How?" exploded Brot.

"Then you can't stop him from going to his own destruction, either," said Wilkes. "They're hooked together, those two things—no, they aren't just hooked together, they're both part of a single thing."

"I don't believe it!" broke in Ulla, "I don't! He wouldn't just commit suicide. Not Mark!"

"Suicide? What suicide?" snarled Brot. "He's doing a job where getting it done'll get him killed, that's all. And Wilkes is right. He can't do anything. I can't do anything. But you can."

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"Me?" There was a note almost of panic in Ulla's voice. "Why do you say it has to be me? He hardly knows I'm here; and you've known him all of his life, the two of you, together! Why should he listen to me? What can I do you can't do?"

"You can make him want life bad enough, girl," Brot's voice softened to a rumble. "You're the only one who can do that."

"I . . .?" she said on a strange note. "Then you do mean, he—"

The chimes of the front door signal sounded through the Residency. Mark turned swiftly and strode softly but rapidly to the door. As he opened it, he heard the door to Brot's room opening behind him. But what else sounded behind him after that he did not hear; for, standing on the Residency steps was Orval Belothen, who had captained one of the scoutships that had alternated on watch over the Navy patrol route. Behind Orval, silver above the browning grass of the landing area, reared his vessel, just returned.

"Meda V'Dan ships, Mark," Orval said. "Six of them. Gathering just at scan limit range beyond the patrol route. And the patrol's due to pass in less than ten hours absolute."

Mark was down the front steps in two long strides and into a ground car.

"Get to the communications building!" he flung over his shoulder at Orval. "Order all cruisers manned and ready to take off as soon as posible."

XV

"Lift and go!" ordered Mark.

They lifted and went—all twelve cruisers and four scoutships. It had taken them over three hours to man the vessels and get them all into space; but the area where the Meda V'Dan were expected to intercept the Navy Patrol was less than seven hours away.

They were still one shift from it when both groups—the three mass forty cruisers of the Navy Patrol and the six alien ships, averaging about mass thirty-two—became visible in the scan cube minutes away from each other.

"They haven't met yet," said Paul, sitting on watch over the scan cube.

"They will," said Mark. "Shift right in on top of them."

The twelve cruisers of Abruzzi XIV shifted all together, coming out in a six-point star-pattern around both the Patrol and Meda V'Dan vessels. But when they emerged from shift, the conflict they had seen impending when they went into it, was already over.

Now, of the three Navy ships, one was literally broken in half. The other two showed gaping cuts and holes in their armor and were drifting out of formation. The alien ships had closed in on them to boarding range, to see what they could pick up in the way of usable equipment.

"Fire at will," said Mark over the intership command circuit.

Filters clamped into place auto-

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matically on the view screens as the area enclosed by the Abruzzi XIV star pattern was suddenly laced with the soundless but unbearable brilliance of white weapon beams and varicolored metal explosions. Abruptly, the filters withdrew again; and the six Meda V'Dan ships were revealed, drifting now, torn and broken, while the hull of the cruiser around Mark and his crew pinged and snapped with the sound of cooling weapons.

The air in the cruiser was stiflingly hot and stank of burned insulation. But the fans were clearing and cooling it once more.

"I'm surprised they didn't bring more ships than that—the Meda V'Dan, I mean," said Paul somberly, looking into the nearest screen. He was tight-faced and a little pale with the suddenness of witnessed death.

"They didn't expect us to react this soon—whatever else they expected," answered Mark. His own voice sounded strange in his ears. He bent to the intership command phone.

"Move in and search for survivors," he said. "The Navy ships first."

But there were no survivors. It was part of the ugly business of combat in space with the kind of weapons both sides carried, that there was not likely to be any—but the search for them was always made. It was made now; and the hold area of Mark's cruiser became a morgue for whatever human bodies could be found, so that they could be returned for burial.

"Now where to?" asked Maura Vols, when the last of these had been brought aboard. Mark had concentrated his most capable people on the ship he had designated flagship for the Abruzzi XIV fleet. In theory, any of Maura's pupils could navigate a vessel on his own. In practice, Maura navigated the flagship and her figures were relayed to the other vessels, who followed obediently—although the student navigators were required to calculate on their own so that they could check their results with hers.

"Home?" Paul asked. "Or Navy Base?"

"Neither," said Mark. He breathed deeply. He had worked a long time for this moment. Now that it was here, following the instantaneous action of the battle, it felt strange—like an impossible dream suddenly turned into reality. "We'll shift to the Meda V'Dan world; and attack that city of theirs."

There was no response from Paul or Maura. Mark looked up to see them staring at him.

"That's right," Mark said. "That's an order. Get to it."

Maura turned away, and went toward the navigator's section of the command area. Then Paul turned and went back to his scan cube and communications equipment.

It was three shifts to the edge of the system containing the Meda V'Dan world. On Mark's ship those

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aboard were generally silent as the shifts were made. It was one thing to practice with ship-mounted weapons; it was something else again to see the results of their use, and the use of other weapons like them. One shift out from the Meda V'Dan world, Mark spoke over the command circuit to the personnel on all twelve ships and four scouts.

"The scouts," he said, "will wait at a distance of one planetary diameter. In case of anything going wrong, they're to head immediately for Abruzzi station. The cruisers will go in on command together to just over the city and make one slow pass, doing as much damage to the buildings as possible. If there's no return fire, I may order a second pass. If not, all ships—I repeat, all ships—are to get out as quickly as possible. If there's no pursuit, we'll join up together at the edge of this system to return. Otherwise, each vessel will make its own way home. Understood? Ship commanders acknowledge."

One by one the ship commanders answered over the command circuit.

"All right," said Mark when they were through. He sat down in his control chair and fastened himself in. "All ships take order and distance from the flagship."

They went in.

There was a heavy cloud cover at three thousand feet over the Meda V'Dan city this day. Their ships broke through this suddenly to see the wide ranks of the identical buildings directly below them.

"Fire at will," said Mark over the command circuit; and the beams of their weapons raked the thin walls of the structures below, sending explosions mounting into the air.

For less than five seconds, they were actually above the city, itself. Then their beams stabbed and seared only the slagged rock beyond it; and Mark spoke in the command circuit again.

"Good enough," he said. "Everybody out."

His flagship headed toward space at eight gravities and his head swam. Then they were out at orbit distance and the sudden, flicking change of a short shift left them at the edge of the Meda V'Dan system.

"Ships!" snapped Paul, his voice suddenly a little hoarse, from where he sat with the communications instruments. "Ships—dozens of them—lifting from the city."

"Get out of here!" said Mark into the command circuit, and heard the words come blurred from between his clamped teeth. "No formation. Each ship home independently. Move!"

He lifted his head from the inter-ship circuit to speak on ship's circuit to Maura.

"Hold shift," he said. "We'll see the rest of them off, first."

"Hundreds of ships," said Paul from the scan cube. His voice was no longer hoarse, but there was a numbness to it, as if he was reporting

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something beyond belief. "Still coming up from the city. Like bees swarming . . . the leaders in space, already, moving fast our way."

Around the flagship, the other cruisers were disappearing one by one, like projected images when the light in the projector is turned off. There were eleven of them—were nine—seven—four—one . . .

"Ship *Jonas!*" said Mark over the command circuit at the last ship still hanging there. "What's wrong?"

There was no answer. Then the *Jonas* also disappeared.

The air temperature inside the flagship suddenly shot up twenty degrees as a flame missile from the front ranks of the on-coming Meda V'Dan exploded only a few hundred yards short of the cruiser.

"Shift!" said Mark to Maura. The alien ships, the alien system, vanished from the screen before him and he looked out instead on the silent and peaceful star scene of four light-years away.

"Home?" Maura's voice asked him.

"Navy Base," he said.

"Yes, sir," she answered.

He broke the circuit and sat back. After a second he looked up as a shadow fell across him. He saw Paul standing over him.

"Navy Base? Now?" asked Paul in a low voice. "How'll we get out again if they find out what we've done?"

"I want them to find out," said Mark. "We won't go all the way in. We'll stop at one of their approach points and turn the bodies of the Patrol casualties over to it. I think we can do that, tell our story and get out before those in command at the Base this tour of duty can get ships out to stop us leaving. And once we're gone, they'll have a chance to think it over; and maybe they'll decide not to do anything until they've consulted Earth."

"You think so?" Paul said.

Mark smiled soberly.

"I'm counting on it," he said.

Nine hours later, their cruiser drifted up to a large, checkerboard hulled globe, beside which floated a light scoutship like a minnow invisibly tethered to a beach ball.

"Approach point, this is ship *Voltan,*" Mark said. Somewhere, a few thousand miles farther on, Navy Base itself was lost in the light of Murgatroyd's Onion. "We are a vessel on Navy lease to Abruzzi XIV, Garnera IV. Outpost Station Commander Mark Ten Roos, speaking. We have cargo to transfer to your approach point station. With your permission, I'll come over and tell you about it while the cargo's being shifted."

"Come ahead, Commander," answered a young voice. "Sub-Lieutenant Sharral Ojobki speaking. I'll meet you just inside the lock."

Mark ordered the cruiser in to contact range with the globe; and a tubeway was projected from the cruiser air lock to the globe's entrance. A couple of minutes later he

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passed through that tube, to be met within the air lock of the approach point station by a startlingly tall, lean, and dark young officer.

"Pleasure to have you visit, Commander," Ojobki said, shaking hands. "Nothing ever happens on approach-point duty. What's the cargo—and can you stop for a drink?"

"I'm afraid not," said Mark. He followed Ojobki's towering figure through the inner air-lock door into the control center area of the station globe. It was a wide room with walls curving to the angle of the hull overhead and equipment of all kinds, including communication equipment, against a far wall. There were two Navy enlisted men on duty—one at the communications equipment, the other working at a desk surface with what looked to be station records.

"Too bad," said Ojobki. "The cargo?"

"Bodies," said Mark.

Ojobki stood where he was, looking down at Mark with the welcoming smile still on his face. After a moment, the smile slipped into a baffled frown.

"I'm sorry, sir . . ." he said after a second. "I guess I don't follow you."

"I'm bringing you what I could find of the bodies of your men in the three ships of your Wing Red Four Patrol Unit. They were hit off Domsee by six Meda V'Dan ships." Mark stood aside as the two of his Colonist crew came through the air lock behind him, carrying the first of the frozen, blanket-wrapped bodies.

"Lay them down over there by the wall," Mark said.

The Colonists obeyed, setting their burden down gently and then going back out past another two who had just entered with another blanket-wrapped burden.

"I—" Ojobki broke off. He stepped over and began to unwrap the blanket from the front end of the object. The crewmen slowed, hesitated and glanced at Mark.

"Let him look," said Mark.

The two men stood still. Ojobki threw back a section of the blanket and looked. His face twisted. He carefully wrapped the blanket back in place and stepped back from the body. At a nod from Mark the two took it on to lay it down beside the first one that had been brought in.

Ojobki's throat worked. He turned to Mark.

"I don't understand . . ." he said to Mark. His voice was unsteady, shaky at first, but grew firmer. "You say the Meda V'Dan did *this?*" He shook his head like a man trying to get rid of the effects of a blow.

"I've got to report this . . ." He started to turn toward the communication equipment, then froze as the side arm Mark was wearing appeared abruptly in Mark's hand.

"Not just yet," said Mark. He gestured with the weapon at the Navy enlisted man sitting at the equipment. "All right. Move away from there."

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The enlisted man stared. Slowly he got to his feet and backed away from the equipment.

"Good enough," said Mark. "Stand still now."

He turned back to Ojobki.

"I can't take any chances on being held up, now," he said, "I've got to get back to Abruzzi XIV station. After we smashed the six Meda V'Dan vessels that hit your Patrol, my ships and I went on to the one Meda V'Dan world we know about; and hit their city to pay them back. I'd warned the aliens not to touch Navy ships."

Ojobki stared back at him as if Mark was talking some strange foreign tongue.

"Here," said Mark. He reached into a pocket with his free hand and came out with a small gray spool of wire, which he dropped on the top of a nearby instrument. "There's a copy of the record of our fight with the six alien ships and our pass over their city."

He glanced over at the two men currently carrying in a body. There was a long row of the silent objects, now, on the other side of the room.

"How many more?" Mark asked.

"This is the last one," said the Colonist in the lead.

"All right," said Mark. He waited until the two set their burden down and headed back out the lock. Then he backed toward the lock himself, keeping Ojobki and the two enlisted men covered. "You can notify your superiors as soon as I go. Tell them, though, that no matter what the Navy does, we're going to stay where we are and defend our Colony."

He backed out through the open inner air-lock door; and turning, sprinted through the tube back into the cruiser.

"Pull tube," he said to Paul, as soon as he was back inside his own ship. "Home to Abruzzi XIV."

Back at Abruzzi XIV, they found all the other eleven cruisers and four scouts safely returned before them. Mark nodded, and called a meeting at the Residency of all the station Outposters, together with Jarl, Ulla, Wilkes, Lily, and the new factory production head, Age Hammerschold.

"I want a watch kept, by one of the scouts, continually on Navy Base," he told them. "Unless I've been dead wrong from the start, most of the Navy, or maybe all of it, is going to be abandoning the Base in the next week or so. And Brot, now's the time to get together here those Outposters I had you make a list of. The ones we can work with— because from here on it's a job for all the stations and all the Colonies. We're going to sink or swim together."

XVI

It would take twelve days before all the Outposters on Brot's list could be notified and gathered in from the half-dozen Colony Worlds spread out through three different solar systems. For most of them had nothing

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but ground transportation available to them—the Navy always having taken care of movement between the worlds and stars.

Consequently, the sixteen ships of Abruzzi XIV became busy acting as transports. Meanwhile, what Mark had predicted came true. The Navy precipitously abandoned Navy Base without even leaving caretakers behind; and pulled back to Earth. Four days later, from Earth to Abruzzi XIV came a single tough heavily-armed little ship, with the black Outposter seal of a gauntleted hand cupping a star in its palm emblazoned on its hull.

It landed without hesitation directly under the fixed plasma rifles Mark had ordered set up to cover the landing area; and two competent-looking men in Outposter uniform but with colonels' insignia on their shoulder exited from the ship and demanded to be taken to Mark.

They were brought to him in the library of the Residency, where he sat behind a desk laden with unfinished paperwork.

"Gentlemen," he said, getting to his feet as they were ushered in. "Sit down."

"This isn't a social call, Commander," said the older of the two. "You're under arrest. We're here to take you back to Earth to stand charges of genocide and incitement of aliens to genocide."

"I'm sorry," Mark shook his head. "But I'm not going anywhere, right away. And for that matter, neither are you." He nodded at the door behind them and the two ranking Outposter Headquarters officers turned around to see a couple of young Colonists holding plasma hand-rifles aimed at them.

"You're under arrest yourselves," said Mark. "Take their side arms." He watched as the colonels were relieved of the handweapons each wore in regulation Outposter fashion. "And now, you might as well sit down."

He himself sat and nodded to the two Colonists; who withdrew, taking the officers' guns with them.

Neither colonel moved toward a chair, however. The older of the two, a tall, spare man with thinning gray hair, black eyebrows and a narrow jaw, stared hard at Mark.

"You're resisting your own superior officers?" he said.

"Not any more," said Mark. "Abruzzi XIV is an independent Colony now; and all of us here who were Outposters have emigrated to it and become Colonists."

"Colonists!" said the older colonel. "Revolutionists—that's what you are. Every man sent out to the Outposts is sworn to protect human life; and you not only haven't done that, you've stirred up the aliens to attack Earth." His mouth was a pinched slit. "What're you going to do with us then? Shoot us?"

"Just keep you quiet for a while until I can take you for a short trip," said Mark. "Then I'll send you back to Earth to tell them what you saw."

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"While you run the other way?"

Mark shook his head.

"I'll be coming to Earth, too," he said. "Just as soon as I've got things wound up here. But meanwhile—" He reached out and spoke into his desk communicator, "You can come and show the officers to their quarters now," he said into the instrument.

The two armed Colonists reappeared and ushered the colonels out. Mark spoke into the communicator.

"Prepare the flagship for immediate lift-off on a twenty-hour cruise," he said.

Five minutes later, Mark's work was again interrupted by another visitor. This time it was Ulla.

"You aren't going back to Earth with them?" Ulla said without preamble. Her face was pale.

Mark hesitated.

"No," he said. "Sit down?"

"You're sure?"

He smiled.

"What's wrong with me, today?" he said. "No one wants to sit down when I ask them to. Those officers wouldn't; and now you won't."

He reached over and turned the chair by the side of his desk a little toward her.

"Sit down," he said. She came and sat—but stiffly upright in the chair. "Tell me how you happened to find out those officers were here to take me back."

"Don't you think I've been expecting someone like that?" she said. "Don't you think all of us have? You let us know you expected something like this right from the start; and then these men come. What else are we supposed to think, but that you're going back with them to stand trial?"

"I see. You've talked to them," Mark said, watching her closely.

"To them, first." She stared unflinchingly at him. "Then I came to you. But you promise me you're not going to let them take you back?"

"I promise," he said.

She looked at him suspiciously. For a long couple of seconds they watched each other without words; and then something began to move between them that did not need words. Abruptly Mark got to his feet, picked up some papers and put them away in a file drawer so that he turned away from her. When he turned back and sat down again, his face was settled.

"Now you've made up your mind," she said.

"I'm always making up my mind," he said.

She shook her head. "Don't play words with me. Please!" she said.

"I'm not."

"Yes, you are." She leaned forward with one hand on the side of his desk. "And it's not right for you. You were the one who made me see sense about Jarl. I really only wanted to find someone else to pin the faith I'd had in Dad before I saw how the Navy really was, out here. I thought I could find it in myself by saving Jarl. But you were right—Jarl didn't any more deserve to be saved,

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than any other Colonist. In fact, he doesn't even need or want it, now. He's like a cat that'd fall on its feet, anywhere you tossed it."

"So now you think you'll save me, instead," said Mark.

"No," she answered. "I don't think I can save anybody. Brot thinks I can. But I know better. All I can do is ask you to save yourself."

He shook his head.

"Don't do that," she said. "You act like you hate people; but you really love them—and we all know it. You love them so much you're prepared to believe the worst of them and go right on working to make life better for them, even though you expect them to kill you for it. But you're part of people, too. Why can't you love yourself enough to save yourself from the rest of them?"

He shook his head again.

"Lions have teeth," he said; "and they can't help using them. That's lion nature. Take a thorn out of the paw of one of them and, in spite of the folk tales, he's not likely to lick your face." He smiled a little. "The human race always turns on the man who makes it live—and pays its debt by getting rid of him. The war leader gets tossed into the rubbish heap in peace time; the man of peace is crucified once fighting starts."

He stopped speaking. He had not meant to say so much; and he was a little startled to hear the words pour out. But, looking across the corner of his desk at her, he saw that even with this he had not convinced her.

"I'm sorry, Ulla," he said, more gently. "But it comes down to this—there's a physics to human events; and one of the natural laws of that physics is that if you do a good deed, you've got to pay for having done it. You don't understand this, Brot doesn't understand it, Wilkes doesn't understand—but that doesn't change anything. The law goes right on working, just the same, and there's nothing I can do about it."

She got to her feet. Her eyes were hard.

"I don't believe you!" she said. "All right, maybe there are laws like that. But I don't believe a man who could figure out how to change history can't figure out how to save himself, once the change's made. I just don't believe it! The trouble with you, Mark, is you've made yourself face the possibility people could turn on you so long that you've forgotten it's only a possibility, not a certainty. Now you're going to lie down and die when you don't have to, rather than admit you don't have to!"

She turned and went to the door. With her hand on the latch button, she turned around again.

"I can't make you change," she said, "but I can do one thing. I can make sure whatever you let them do to you, they do to me, too! Try that on your conscience about people! If you let them destroy you, now, you'll be letting them destroy someone else as well—someone who didn't even do your good deed for them!"

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Turning once more she went out.

He sat where he was for a little time without moving. Then, slowly he went back to his paperwork.

A little over two hours later, his desk communicator buzzed.

"Yes?" he said.

"Flagship crewed and ready for lift-off on twenty-hour cruise as ordered," the voice of Paul answered.

"Good," said Mark. "I'll be right there."

He broke connection on that call and made another.

"Bring those Outposter colonels back here," he said into the communicator. "And get us a couple of ground cars. Tell them I'm taking them for a short trip."

He took the two to board the flagship by a circular route that hid their boarding from the small ship that had carried them from Earth. Five minutes after they were all on board, the flagship lifted off.

"Where are you taking us?" the older colonel asked, once they were in orbit.

"Colonel—"Mark began, and broke off. "I don't know your name."

"Branuss," said the colonel stiffly. He nodded at his companion. "Colonel Ubi."

"All right, gentlemen," said Mark. "To answer the question, I'm not going to take you anywhere. I'm going to let your ship take us some place. Colonel Branuss, will you be good enough to get on the communications, there, and talk to your ship back at Abruzzi XIV? Tell them to lift off and join us here—and also, Colonel . . ."

Branuss, halfway to the communications equipment, stopped and turned.

"Remind them that they may be a very good ship; but that this cruiser has the armament to turn them into junk in two minutes—and at any attempt by them to do anything but follow orders, we'll open fire."

Branuss turned sharply on his heels and went on the communications equipment. Mark heard him relaying both the directions and the warning to the ship on the planet's surface below.

The ship from Earth had been standing by ready for an emergency lift-off at any minute; but the lift-off they had been ordered to make was not an emergency. It took them nearly an hour to run a routine countdown check and nearly another hour to come alongside the cruiser in orbit.

"Now," said Mark to Branuss, who was back at the communications equipment and waiting. "They know where the world is that holds the Meda V'Dan city we hit some days ago to start all this. Tell them to navigate both ships there. They navigate and give us the figures. We'll follow. That's so you won't have any doubt you've been to the right place afterward. And tell them, too, I've arranged to have three other cruisers follow us one

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shift behind. If they try to duck away from us by shifting some place else while we make an on-course shift, the following vessels will spot them in their scan cubes and hunt them down."

"That's not necessary," said Branuss, tightly. "If I order our ship to go some place, it'll go there."

"Good," said Mark. "But those three cruisers will still be following, just in case. We'll be doing our own navigating on this ship, too, just in case they think to navigate to somewhere else than the Meda V'Dan world."

Branuss relayed the orders.

Five shifts in a direct line from Garnera system to the system containing the Meda V'Dan world brought them to orbit around it. The two colonels watched the viewscreens tensely as the alien world appeared upon it. For a few seconds they stared at it; then Branuss swung about to face Mark, who was standing a few feet away.

"No ships," he said.

His voice was tight; and his face was not exactly pale, but its features were set hard.

"You didn't think we'd get this far and live, did you?" asked Mark.

He waited for an answer.

"No . . ." said Branuss grudgingly.

"No," said Mark. "And now we have. And now, for the first time, it begins to occur to you that the reaction of the Meda V'Dan to my raid on their city may not have been exactly as the Navy and the Earth government assumed it would be. Isn't that right?"

Again, he waited.

"Possibly," said Branuss, as if the word was a part of him that had to be amputated before it could be uttered.

"Possibly," echoed Mark, gently. "Shall we go down to the city itself, then?"

He had to repeat the question before Branuss turned to the communications equipment and ordered the smaller ship to lead them down to the location of the alien city.

Once again, as on the day of the raid by the Abruzzi XIV cruisers, there was a cloud cover only a few thousand feet above the city site. The smaller ship from Earth gave the cruiser the coordinates for approach; and together, the two vessels descended, until they broke through the thick white layer of the cloud-stuff to emerge into the gray day below above the bare plain and the slagged rock that encircled the city site.

The two ships, having emerged over location, hung still; and their viewers looked down to show on screens what was beneath. For a long moment in the cruiser there was silence as everyone—not just the two colonels from Earth—looked.

Then Branuss turned his head sideways to look at Mark, and spoke.

"There's nothing there," he said.

Mark nodded, at him and at the

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screen which showed five square miles of bare, scarred bedrock littered with metal and other junk, as if some monster picnic had been held and abandoned there.

"That's right," Mark said. "They're gone. They're gone for good. There isn't a Meda V'Dan within light-years of this world or Earth—and there never will be again."

XVII

When the two ships landed again back at Abruzzi XIV, Mark escorted the two colonels over to their own vessel.

"Here," he said, as they parted at the fore air lock of the smaller ship. He handed Branuss two gray wire spools and a black report tape.

"These grays," he said, "are copies of our recorded action with the Meda V'Dan following their attack on the Navy patrol, and our raid on their city. The black tape report spool's got a message from us to the Earth-city Government; explaining why we acted the way we did, and why the Meda V'Dan moved out. It also offers an agreement to the Earth-city by which it, and we, the Independent Colonies, can both benefit from our new relationship. I'll expect a favorable answer to the general points in the agreement in ten days.

"If we haven't got it by then we'll assume the reaction of Earth-city government is negative; and go ahead with plans that don't include Earth."

Branuss took the spools without question. There was about him something of the same air of dazed belief and automatic obedience that had characterized the Colonists Mark had seen loading aboard the *Wombat* on his way to Abruzzi XIV, months earlier.

"They can't answer in ten days . . ." the colonel muttered. "That's impossible."

"So was the Meda V'Dan situation out here," said Mark. "Now, it's not impossible. Ten days. Good-bye, gentlemen."

He watched them board, and the small ship seal and lift. Then he went back to the Residency. But he was barely once more immersed in his mass of paperwork, when he found himself invaded by Brot, Wilkes, Ulla and Lily, all together.

"The Meda V'Dan have gone?" demanded Brot as soon as the group was inside the library door. "And you knew they'd go? Why'n hell didn't you tell the rest of us?"

Mark leaned back in his chair and wearily rubbed the inside corners of his eyes.

"I didn't know," he said. "I only guessed they would. I bet on it, in fact. But the bet paid off."

"If you were guessing that far ahead," said Lily, "what did you need me digging into the Meda V'Dan philosophy and character for? I never guessed they could be scared out by just a few ships attacking their city. Particularly a city

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where they must have had thousands of their own vessels and weapons, and everything else. I still can't believe it."

"They weren't scared out," said Mark.

"No . . ." said Wilkes, thoughtfully. "I see what you mean. They went because that's their behavior pattern. But what Lily asks is a good question; and I'd like to ask it, too. You didn't need me, or her, after all? Then why did you just pretend to give us work to do? I thought . . ." his voice was a little husky. "I really thought I was being useful to you."

"You were," said Mark. "So was Lily. You ought to know me better than that. I was out to get rid of the aliens. But we had to learn as much about them as possible before we lost them—because we're going to have to know as much as we can when we start trying to deal firsthand with the Unknown Races, farther in towards the Galaxy Center. You and Lily, and her assistants, have been putting together what we have to know to make the Independent Colonies work."

"So, now *we're* going to trade with the aliens farther in?" Brot demanded. "You planned that from the start, too?"

"If we got rid of the Meda V'Dan, yes," said Mark. "There's a market on Earth for alien goods—and plainly there's a market among the Unknown Races somewhere for human goods, or it wouldn't have been worth the time of the Meda V'Dan to steal from us, or trade with us for what they couldn't use themselves. We can take over those markets to pay for the things from Earth-city we'll still need, until we get heavy manufacturing and other industry set up out here."

"All right—" began Brot.

"Forgive me—" said Mark, "but this is something I'd rather not go into now. I'll be bringing it all out at the meeting with the other Outposters in just a few days. Can you wait until then? I've got"—he waved at the desk—"more than I can do here between then and now as it is; and once I start explaining, it won't be easy to stop. There're certain things that have to be done before that meeting, no matter what else happens."

He stopped talking. They looked at him. Then, Brot grunted and swung his power chair around. Silently, following the ex-Station Commander, everyone but Ulla turned and went out.

"I'm afraid," said Mark to her, looking at the door that had closed behind the other three, "I've made everybody think I didn't trust them."

"No," said Ulla. "They'll understand. But give them a little while to get used to the Meda V'Dan being gone. It's a big thing, you know—and no one else expected it, the way you did."

"No," said Mark. "That's true."

"I'll talk to them," she said; and left, herself.

He returned to the unrelenting

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pressure of the work on the desk before him.

Four days later, the last of the other Outpost commanders invited to the meeting had been gathered from their various worlds and stations. There were one hundred and forty-three of them, one for each of the active Colonies that had been guarded by Navy Base. They met in the auditorium of Abruzzi XIV's Section I Village.

Up on the stage at one end, Mark sat in the center of a long table facing the audience; with Brot and the other station Outposters to his right, and Wilkes, Lily, Jarl, Maura Vols and Age Hammerschold to his left. A voice pickup overhead carried their voices from the stage to the far end of the auditorium and other pickups out over the heads of the audience waited to pick up questions or comments from the floor.

"Before we invited you here," said Mark without preamble, as soon as Brot had introduced him, "you knew our Abruzzi XIV ships had smashed a gang of Meda V'Dan vessels that cut up a Navy patrol, and that we'd gone on to hit the Meda V'Dan city. I take it there's no one here who thinks our action wasn't justified?"

There was a mutter quickly rising to a growl of approval from the audience and a burst of hard, brief applause.

"All right," said Mark, "since then, up until this moment, you've heard that the Navy's abandoned Navy Base and pulled back to Earth, that Abruzzi XIV's declared its status as an Independent Colony, and that a few days ago I went to the Meda V'Dan city with a couple of Outposter senior officers from Earth who were here to arrest me; and we found the Meda V'Dan city was gone."

Another burst of applause, brief but thunderous.

"All right," said Mark. "Then you're all pretty well briefed on the situation as it stands right now. Abruzzi XIV's gone ahead and declared its independence, and we're going to stick to that. The rest of you can do what you want, of course; but to put it bluntly, what's needed right now is for all of us to go independent together and form a community of Colonies that can react as a group—toward Earth, or any Unknown Races we run across. In fact, I've sent what amounts to an ultimatum to the Earth-city that's tailored to the idea we're all going to be united eventually in independence. You've all been handed copies of that message; and I suppose most of you've had a chance to read it by now. But to save time here, suppose I run over the important points of it."

He paused and reached for a typescript that was lying on the table in front of him.

"There're two parts to it," he said. "The first is an explanation of what happened, and why the Meda V'Dan left. This explanation isn't just guesswork. It's a series of conclusions

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drawn about the Meda V'Dan character by Abruzzi XIV's team of experts, who are here this evening. He nodded to his left. "Mr. Wilkes Danielson, one of the Earth-city's foremost anthropologists and just beyond him, Miss Lily Betaugh, one of our Colonists who was formerly a full professor at the University of Belgrade. Mr. Wilkes is responsible for the theory about the Meda V'Dan character on which the research of Miss Betaugh and her staff was based."

He broke off.

"While I'm at it," he said, "I'd better introduce the rest of our Colony's experts. Just beyond Miss Betaugh is Jarl Rakkal—you probably recognize the name from banking matters back in the Earth-city—who's set up a highly successful economic system, not only for this Colony, but potentially for all of our Colonies in association if and when we reach that point. Mr. Rakkal's come up with trade goods that interested the Meda V'Dan for trade with the Unknown Races and should undoubtedly interest the Unknown Races, themselves. Mrs. Maura Vols, just beyond, has been our lead Navigation and Positions Officer and also head of our school for student navigators. A school we plan to expand into all areas of ship handling, under her direction. At the end is Mr. Age Hammerschold, our factory executive. . . ."

He turned to his right.

"And, of course," he said, "you all know, or know of, Brot Halliday, whom we've got to thank for organizing the watch on the Navy patrols and for the success of our encounter with the Meda V'Dan in space and at their city—"

"What the hell?" snarled Brot under his breath. "Why are you trying to put off all the credit on to somebody else? Why?"

"Thanks to all these people, and not forgetting the other Outposters at Abruzzi XIV"—Mark nodded to his right at Race, Paul, Orval, and an Outposter named Soone who had finally filled the vacancy left by Stein—"I was able to put together the half of the message, which explains the Meda V'Dan's leaving and tells Earth what we want from them, and what we can give them in exchange."

He shuffled the typescript, glanced over a page, and cleared his throat.

"Briefly," he said, "—and you can read the details later—we were able to get rid of the Meda V'Dan because they lacked a modern civilization, in our terms. To quote from the message: '. . . *The work of Mr. Danielson and Miss Betaugh indicated that these aliens actually had been frozen in a very primitive cultural pattern; to which they attributed their survival as a race; and to which, therefore, they would adhere undeviatingly as long as there was an alternative course of action that permitted continuing adherence* . . .'"

Mark ceased reading and looked up from the page to the audience.

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"What that means," he said, "is that the Meda V'Dan would do anything rather than change their ways; because they believe that they'd go on surviving as a race only as long as they didn't change. In fact, they told us, when we visited their city earlier, that they'd been around before all other races were born, and they'd still be around when all other races were dead."

He paused a second to let that sink in.

"That bit of talk," he said, "was our first evidence that the work done by Mr. Danielson and Miss Betaugh was on the right track. By sheer chance on that same visit I was lucky enough to get down into the lower part of one of their city buildings and see that the bottom levels were taken up by large drive engines. In short, each one of their buildings was an oversize spaceship with room inside to hold their smaller ships and everything else they wanted to carry about."

He paused again, and Wilkes spoke up quickly.

"Commander Ten Roos," Wilkes said, "is being unduly modest about this whole matter of interpreting the Meda V'Dan character—"

Mark put a hand gently on the older man's shoulder to interrupt him.

"That's all right," he said to Wilkes, the pickups overhead carrying his words to the end of the auditorium, "these aren't Earth-city representatives. We can tell them the truth. In fact, they need to know the truth so they can get a clear picture of the situation. The fact is, I wasn't much more than a focal point for all this. I couldn't have done any of it without these specialists and experts you see here at the table. But, to get back to the Meda V'Dan and why they left—"

He took his hand from Wilkes's shoulder; and the older man sat back, silent. Mark went on.

"It has to be pretty much guesswork as to how they started into space," he said. "Chances seem to be they were contacted by some interstellar-traveling race when they were still in the culture stage we saw them in now. Somehow, they got hold of ships themselves, and simply transplanted that culture into space. What they are, essentially, is a nomad culture which carries all of its belongings with it as it travels and doesn't so much inhabit worlds it stops on, as camp there."

He broke off.

"Take a look at page eight of the typescript," he said. "Our estimate of their culture's set down in detail there—" There was a rustling of pages throughout the audience as his listeners went to the page he had mentioned. "Briefly, the Meda V'Dan live by trading if they have to, but prefer to steal if they can because it's easier. Whenever they run across another race they can steal from profitably, they camp in the vicinity and take as much as they can for as long as they can. When the

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other race starts getting after them for stealing, they simply pack up and go elsewhere—not because they don't have the equipment and the technology to stand and fight back; but because they're committed to their nomad existence and it's simply more profitable to go find another victim race than to stay and argue the point."

Mark turned several pages of his own transcript and laid it flat before him.

"That's the sum of it, then," he said. "Indications are the Meda V'Dan never were able to tell one of us from another—just as they all looked alike to us—and they no more understood our culture and ways than we did theirs. But there was something else in their case. They didn't care whether they understood or not; and consequently when this one Colony hit their home base with a handful of ships, they assumed that the human race as a whole was fed up with them—and left."

He paused.

"Now, look at the final section that begins on page 23," he said. "This is the short agreement I sent back to Earth for the government there to accept, or refuse. But I think they'll accept; since they've got nothing to lose but some military hardware they don't need anyway, and a dumping ground for their excess population, which they'd have to find some other way of curbing in any case. What the agreement asks is that they give up Navy Base, with all its equipment, supplies and ships that have been left behind, to the Colonies; that shipments of Colonists cease immediately, newcomers from Earth being welcome out here only as voluntary immigrants who have been accepted by some particular Colony. We should be able to pick up just the sort of professional and trained people we want by sifting those who do want to immigrate out here voluntarily. Finally, they can also cease shipments of supplies to the Colonies—that's something they'd do anyway—and any trade with the Unknown Races must be channeled through us."

Mark pushed the typescript from him.

"There you've got it," he told the audience. "We may be a little pinched for home-grown vegetables for a winter season or two on our various worlds. But there's enough food stocks stored in Navy Base to see that none of our Colonies will be hungry for several years. Meanwhile, we can be training people to handle the Navy ships and we can start almost immediately sending exploratory vessels in toward Galactic Center to contact the Unknown Races for trading purposes. We've got pretty good evidence the UR aren't likely to be either inimical or uncooperative—otherwise the Meda V'Dan'd have been wiped out long ago."

He paused and looked slowly from front to back over the whole audience.

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"All right," he said. "There it is. Now, what Abruzzi XIV would like from all of you assembled here would be a vote of confidence. How about it? Will you give us your vote?"

There was a silence lasting several seconds, then a lean, middle-aged Outposter in the third row got to his feet.

"I'm Commander Murta Vey, Thanought IX station, Alameda II," he said. "Generally speaking, I've liked what I heard. But I've got a question—why didn't you let the rest of us know what you were doing here before this? It seems to me we had a stake in it as well as you—"

The talk began. It ran back and forth between audience and stage for nearly two hours before Brot slammed his wide palm on the table in front of him and shouted everyone else down.

"Damn it!" he roared. "Are we going to sit here all night? The Meda V'Dan are gone—the thing's done, isn't it?"

He waited. After a second there was a rumble of agreement, drowned out by applause.

"All right!" shouted Brot. "And now that it's done, you like it better this way than it was before, with the Navy sitting there doing nothing and more half-collapsed Colonists being dumped on each of us at least twice a year, and the aliens shooting us up, every so often—don't you?"

This time the applause was louder and more prolonged.

"Then what're we waiting for?" demanded Brot. "Let's take a vote, and end this business!"

The applause this time was overwhelming. Brot slumped back in his power chair, grunting with satisfaction and waving at Mark with his one good hand.

"Take over," he said.

"All right," said Mark; and his voice carried via the pickups out over the last of the applause. "Let's vote by getting up and leaving, all who're in favor of what Abruzzi XIV's done, and the agreement we sent Earth. Those who don't agree, can stay here and make their own plans, accordingly."

He got to his feet. The others on stage rose behind him, all but Brot, who turned his power chair away from the table. Down on the auditorium floor, the audience was already on its feet and pouring into the aisles.

By the time Mark and the others from Abruzzi XIV reached the floor in front of the stage, those aisles were full. Slowly they followed the last to leave; and as they left the auditorium by its far doors, Mark turned around and looked back.

Less than a dozen figures still stood in a ragged group down by the front rows of the now-empty seats stretching in their ranks the length of the building.

The audience spilled out onto the grass and pavement of Section I village, dark figures in clumps and groups, still talking under the newly

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risen moon of Garnera IV. They moved generally toward the Village's original community mess hall—now a gym and sports center—where food and drink had been laid out. Mark went with the rest, and spent half an hour moving around and speaking to people at the mess hall; then he slipped out quietly by himself and returned by ground car to the Residency.

In the Residency library, his desk was at last cleared of paper. He went around behind it and opened one of its drawers to take out a folder containing some thirty sheets of handwritten paper. In ink on the front of the folder was a brief note in the handwriting of Maura Vols. "*Basic pattern for ten-shift navigation, Garnera IV to Earth*—Property of M. Vols: DO NOT REMOVE FROM FILES!"

He laid the folder on the desk and sat down to the dictagraph to do a short message, which he folded and put in an unsealed envelope, then left lying on his desk. Taking the folder, he went to his room, where he packed a small luggage case.

With luggage case and folder, he went once more back out into the night and down to the landing area before the Residency. The Colonist on duty there did not see him pass; and a few moments later Mark quietly activated the outside controls for the air lock entrance to one of the heavy scoutships and went in, closing the air lock behind him.

The scouts, like all the Abruzzi XIV ships, were currently on standby ready. He needed only to run the check list and heat the engine and operating equipment. Then the scout was ready to lift, except for a final obstruction check of its take-off area.

Quietly, with the lights in the scout off behind him, Mark opened the lock and stepped out. He made one circuit of the ship, confirming the fact that there was nothing in the way of her lift-off; and he was just about to reenter the lock when a voice spoke behind him.

"To Earth?"

Mark turned. Brot floated in his power chair a few feet away, his face obscured in the shadow of the scout's hull.

"Yes," said Mark.

For a moment Brot said nothing.

"It's a damn thing—" he said then, "a damn thing, you throwing your life away like this."

Mark took a step toward him.

"Dad," he said, "you've got to understand. Earth's going to have to save face. We've got to throw them some kind of bone."

"The hell we do," said Brot. "You said it yourself—they're better off without the Colonies and without supporting a Navy out here. What more do they have to have, icing on their cake?"

"Yes," said Mark. "Common sense only takes care of part of it. There's another part—the fact specific people in Earth-city government have been wrong about the

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Meda V'Dan all these years, putting up with the aliens raiding and stealing when now it turns out any kind of firm action would have put an end to that. They're going to get jumped on by the mass of voters back on Earth—and they'll want a scapegoat, someone to divert attention. If I don't give them one on their front doorstep, they'll come out here to dig one up before they give in; and that could end up wrecking everything. In five years, even, we'll be able to handle the Navy ships, and we'll probably've made contact with the Unknown Races, to say nothing of having all our Colonies self-supporting. But right now none of that's done, yet. We need time to train spacemen, we need the stored food at Navy Base—and Earth Government needs an excuse to give in gracefully. They can blame everything everyone back there doesn't like, on me, and take credit themselves for the good points. They have to have that."

"No," said Brot. He was hunched in the power chair like an old bear growling in a cave mouth.

"I'm sorry," said Mark. He backed up against the air-lock door and reached for its outside control without taking his eyes off Brot.

"I'll go with you," said Brot.

"Now, that would be a waste," said Mark. He felt the outer air lock door move in away from his fingers, opening. "They'd make a scapegoat out of anyone who was with me, too—and one's all they need." He shook his head. "No, I'll go alone."

"Fake it," said Brot. "There're mountains back a few hundred miles from here where you could hide a scout like that for a hundred years. Remember that canyon with the waterfall where I took you hunting on your twelfth birthday? Ditch that ship there; and I'll come get you two nights from now."

Mark shook his head.

"No," he said. "Brot . . . Dad, I'm sorry. But I've got to do this. I'm right about the way they'd act back on Earth, if I didn't."

"You're damn wrong," said Brot. "You think ordinary men've got guts like you? You've already knocked them down. They're not going to get up just to be knocked down again."

"I'm sorry . . ." said Mark. "I'm sorry, but there's only one way to do this so nobody but me gets hurt. Good-bye. . . ."

He stepped quickly back into the air lock, punching the button that opened the inner lock door and closed the outer one. He had been afraid for his strength of will, if Brot had talked even a little more—but the door closed without the older man saying another word.

He turned on the lights inside the scout and went quickly to the control area. He was eager now to get on his way. He sat down in the command chair and initiated the lift-off procedure. For a moment he had a fleeting worry about the closeness of Brot to the ship. But Brot was too old a

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hand not to have moved back a safe distance.

To make sure, however, he flipped his viewing screens on heat response and made a quick scan of the immediate area. There was no human body within fifty yards of him. He lifted ship.

The scout went up with a smooth roar, which whispered into silence as it left the atmosphere and the engines switched automatically to tail chambers. His viewing screens now showed the night side of Garnera IV, black below him. He drove out to a safe distance, switched drive units and programmed for the first shift toward Earth, working from the figures in Maura Vols's folder.

He shifted.

Abruptly, the screens were bright with a different view of stars. He sat for a moment, watching them, then reached for the folder a little wearily and began to compare the figures in it for the second shift with the automatic position reckoning as the ship's computers were already building in on the plot screen before him. It was a purely reflexive reaction, born of the old familiar habit he had cultivated to guard himself at all times. Maura Vols did not make mistakes—particularly where the course she dealt with was from Garnera to Earth—

He checked. There was a figure there that had been erased and changed. There should be nothing in that—but there was something about the figure as it stood now that bothered him, amateur navigator that he was. He went to the wide margin filled with Maura Vols's notes and figurings.

The calculations for the figure he had just read were there. They, too, had been erased and changed. He sat down to check them by his own slow calculations.

It took him less than ten minutes to find what he sought. The new figure Maura had set down was not only a fractional, but a retrograde figure. Not only was it incorrect for an Earth destination, but followed out, it gave him anything but the first jump toward the Solar System he had intended. Instead of being three light-years from his starting point, he was two Garnera system diameters *farther away* from Earth than he had been to begin with. Not only that, but he happened to be in exactly the position that would make possible an easy, invisible return to that same mountainous part of Garnera IV which Brot had recommended to him.

There was a faint sound in the ship. He hesitated, feeling a presence behind him, like a faint pressure on the short hairs at the nape of his neck. Slowly, he turned and looked.

In the entrance leading from the command area to the cabin level, Ulla was standing, gazing back at him. She continued to stand there, even after he had turned to face her.

"I'd never have let you go without me," she said.

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XVIII

". . . They require guarantees," said Jarl. "Guarantees we'll profit from the trades; and penalty payments if the guarantees aren't met."

It was nearly six months since the meeting that had gathered together Outposters from all the Colonies at Abruzzi XIV. It was, therefore, almost six months since Mark and Ulla had left Garnera IV in the scoutship. The recently elected Governing Board for Abruzzi XIV Colony was gathered to decide a matter of some conflict with the government of Earth; concerning the use of some of the equipment formerly belonging to Navy Base as direct trade goods with one of the three Unknown Races so far contacted by the Colonists. They had met in the library of the former Residency, now the Colony Headquarters Building; and there were only two Outposters present—Paul and Brot. Otherwise, the Abruzzi XIV voters had elected Colonists like themselves to govern them—Jarl, Lila, Maura Vols and Age Hammerschold. Wilkes Danielson would have been elected also; but he was upstairs now, dying, in the last stages of his sickle anemia.

Brot sat at the far end of the table by a window, his opinion little in demand at the gathering, and with no great interest in giving it. All his attention was on the landing area. It was spring at Garnera IV, and the first shipload of trading station personnel and recolonists were loading for a destination down-galaxy, to set up a post on an uninhabited world not five light-years from one of the Unknown Races. One of the cruisers was waiting; and already most of those to go with her to that destination were aboard. For weeks now Abruzzi XIV had swarmed with strange Colonists and Outposters from other stations as these were sifted for those best qualified to plant this new Colony. Brot, almost a supernumerary nowadays, had volunteered for the task of certifying those finally chosen.

Now at least that part of the job was done; and his dark eyes were fixed tensely out the window, as he observed the last minute actions about the cruiser, preparatory to its departure. So far, those for whom he watched had not arrived.

"What's the point?" muttered Age. "They've already given the stuff up to us. What difference does it make to Earth-city government whether we use it, or trade it to the Amnhohen?"

"None," said Jarl "But it's a chance for them to twist our arms and hold us up for better terms. You've got to get that straight. Age. They'll hit us any time they get the chance. In this case, they're going back to the old business about Mark."

"What do they want us to do?" snapped Age. "Stop everything else and spend the next ten thousand years trying to find his body?"

Outside, as Brot watched, the

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main entrance to the cruiser was closed and sealed, leaving only the ladder to the open forelock for last-minute cargo and personnel. The Colony spacemen on guard at the lock had now moved out to a safe distance and were checking last-minute items and crew aboard from perimeter. The new grass of spring was dark about the underside of the checkerboard hull.

"Not really," said Jarl. "It's just a means of advancing a claim. Remember, the agreement Mark started to make with them never actually was signed."

"We're acting as though it was," said Lily. "So are they."

"That's right," said Jarl, with a slight cutting edge to his voice. "But I explained all that five months ago. They never will sign as long as they can go on a *de facto* basis, and use the fact there's no official agreement, to make capital out of points like this about trading Navy equipment to aliens. Would you?"

"I suppose not," said Lily, thoughtfully.

"I still say, ignore it—or refuse them, flat," said Age, harshly. "What can they do about it, anyway?"

"Delay current trading sessions," said Jarl. "And they can afford to do that. We can't . . . I mean, we here at Abruzzi XIV. We need that heavy machinery now. They're pinching us."

"No one ever promised them Mark," said Paul, from the end of the table.

Jarl looked down along the table at the young Outposter with a hint of exasperation.

"Mark promised them Mark," Jarl said. "I thought I'd got that through all your heads. It was Mark who sent them the original agreement. Their counteroffer was on its way here—and it was a counteroffer that agreed, provided Mark would surrender himself personally to Earth justice to answer charges arising out of his actions. Then Mark took off from here—"

"Mark and Ulla," interposed Paul, quietly.

"Mark and Ulla, then. What difference does Ulla make?" said Jarl. "The point is, Mark left here to give himself up to Earth. He even left a letter here for us, saying that's what he intended to do, that he anticipated Earth asking for him. Consequently, Earth claims this constituted agreement to their counterproposal, since Mark was the negotiating authority. And we can't deny he was the negotiating authority, because it's to our advantage to hold Earth to Mark's original version of the agreement. In fact, we can't deny it, if we want to carry on trade and recruitment of special personnel from Earth without interruption. The only flaw in the ointment's the fact Mark made some kind of shift error and got lost among the stars, before he could get to Earth."

"I suppose they really don't believe that," said Lily.

"They believe it all right," said

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Age. "Even if they don't—what's the difference? The ship's been lost six months. Wherever in space it is, Mark and Ulla'd be dead from atmosphere exhaustion. They won't come back to bother Earth. And that's all Earth wants."

"In the large sense," said Jarl. "Not the small. And it's the small I've been trying to get into all your heads . . ."

Brot stiffened suddenly, squinting out the window at the recolonization cruiser. A ground car was racing up to it. Now it had halted for checking by the guarding spacemen. A young but bearded man wearing Colonist clothes and a girl with the collar of her nurses' jacket turned up so that it hid her face, were showing papers. The spacemen waved the two of them to the fore air-lock ladder. As Brot watched, they ran for it—and made it. A moment later the lock closed and the first rumble of the cruiser's warming engines sounded.

Brot sat back in his chair, letting out with relief the breath he had held. Farther down the table, he saw Maura Vols eyes inquiringly upon him. He gave her a brief, grudging nod. She smiled a little and turned her attention back to the meeting.

". . . The other Colonies are voting their own officers as fast as they can," Jarl was saying. "But we here at Abruzzi XIV are two years ahead of them in what we've got. Mainly because of my work; and because we've been first, we've been able to cream off the best of the Navy ships and supplies at Navy Base for our own Colony. Now, Earth can afford to take its time. The other Colonies can take their time. But we, Abruzzi XIV, can't afford to take *our* time; because we want to keep the natural lead we've got over the other hundred and forty-three Independent Colonies. We're the ones who put us out ahead in the first place—"

"Were we?" Paul interrupted softly. "I thought it was Mark?"

"As Mark himself said at the Outposter Meeting the day he left," answered Jarl, "he couldn't have done it without us. Oh, don't jump to the notion I'm trying to run down Mark's part in all this. If he needed us, we needed him, too. But we've got to operate without his help now; and the way to do that is to start off recognizing that all of us around this table are the actual, present leaders for the Colonies; and that the Colonies lead the human race. In short, we're important people; and that means we've got a duty to our Colonists—to all the Colonists in general and the race as a whole—to guard that importance and take it into account in making decisions."

"You think I don't?" Age growled. "There's nobody but me to manage those factories—and there aren't any other factories, out here at least. They think I drive them too hard, those people I've got working for me. But I can afford to burn them up. I can't afford to burn me up.

"The rest of you may not agree

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you're important," he said. "But I do. And that's because I am—maybe the most important."

"Not exactly," said Lily, quickly. "Your factories won't be doing anything if I don't interpret the alien psychologies for all of us. Earth always had factory management—but it never had alien relations experts; and that's where the key to success lies."

"And with the trained people to handle the ships to make it all work, don't forget," said Maura. "Don't push, Age. We're all important people, here. We all know it; and we're all interested in seeing our United Independent Colonies develop to everybody's best advantage. Am I right, Jarl?"

"Yes," he said. "Self-interest—enlightened self-interest, of course, is always the best motive. That's why, with all respect to Mark"—he glanced down the table at Paul—"we're better off to have lost him. This is a new era, now, in the Colonies; and his ways belonged to the old. While we—"

Down in the landing area the recolonization cruiser finally took off, with a mounting thunder of engines that momentarily drowned out all possibility of talk in the Residency library. Slowly, the sound faded; and

"There it goes," he said, loudly in the new stillness, "leaving the rest of you sitting here like frogs in a puddle, trying to blow yourselves up big in the universe. Well, you're necessary to the machinery, I guess. So if you weren't all so hell-bent to create yourselves lords of the human race anyway, some of the real people'd have to invent you to do the job. But I don't have to like the fact—or you. And I don't."

His eyes met Jarl's at the opposite end of the long table.

"And you don't like me," Brot went on. "But you aren't going to do anything about me. You'll still need the Outposters here for another ten years or so—even if you like to pretend you don't—and long before then I'll be gone.

"Out there," he said, "that's where the real future is. It's gone and left your kind sitting behind here, talking about it. And it's out there that I'm going to end up, still on the front of the wave; with my grandchild on the one good knee I've got left, and the bad taste of Earth and all of you, both, five hundred light-years behind me."

"What're you talking about, Brot?" said Age, sourly. "Everybody knows you never had any children. Even Mark was adopted; and he's dead. You can move on any time you want to; and no tears shed. But don't talk about grandchildren to me. You'll never have anything you can even pretend to call a grandchild—any more than I've had."

"The hell I won't!" growled Brot, grimly smiling at the skies into which the cruiser bearing Mark and Ulla under new identities had now flung itself out of sight, into free space and the free years to come. ■

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poltergeist

Any power—
any talent—anything
can be used
for good or evil.
Sometimes
only destruction
can be good.

JAMES H. SCHMITZ
ILLUSTRATED BY
KELLY FREAS

Late summer had faded into fall in that region of Orado, and though the afternoon sun was still warm, the season was over at the mountain resort lake. No more than a dozen boats could be seen drifting slowly about its placid surface.

The solitude suited Telzey fine. The last three weeks at college had been packed; the weeks to come were going to be at least as demanding. For this one weekend she was cutting out of the pressure. They were to be two totally unambitious days, dedicated to mental and physical loafing, separated by relaxed night-long sleep. Then, some time tomorrow evening, refreshed and renewed, she'd head south to Pehanron College and dive back into her study schedule.

The little kayak she'd rented went gliding across the green-blue lake toward the distant banks opposite the quiet resort village. Great cliffs rose there, broken by numerous narrow bays where trees crowded down to the edge of the water. If she came across some interesting looking spot, she might get out and do a little leisurely exploring.

She pressed a fingertip against the acceleration button on the console before her. A paddle was fastened along the side of the kayak, but it hadn't touched water this afternoon.

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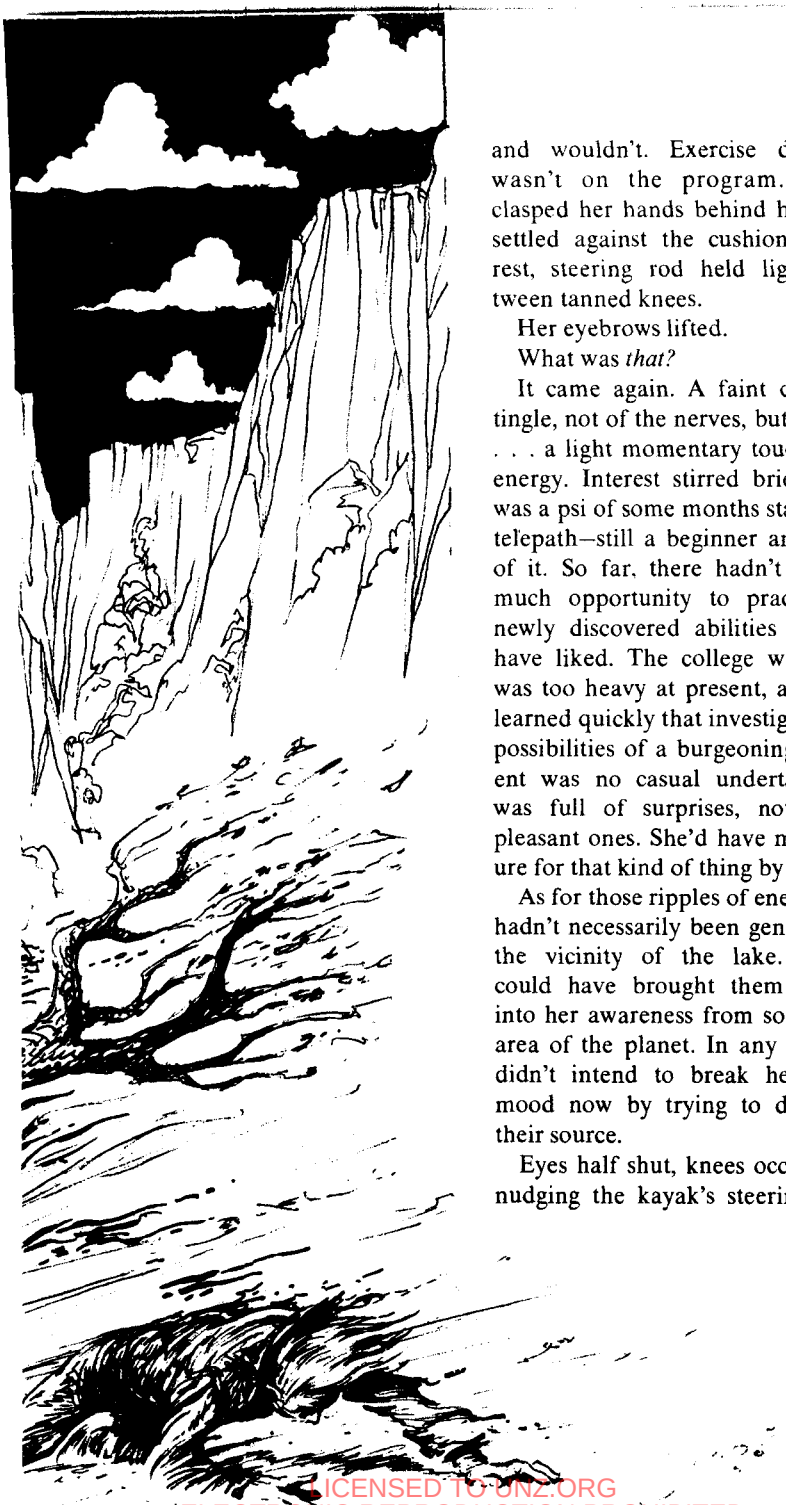

and wouldn't. Exercise definitely wasn't on the program. Telzey clasped her hands behind her head, settled against the cushioned back rest, steering rod held lightly between tanned knees.

Her eyebrows lifted.

What was *that?*

It came again. A faint quivering tingle, not of the nerves, but of mind . . . a light momentary touch of psi energy. Interest stirred briefly. She was a psi of some months standing, a telepath—still a beginner and aware of it. So far, there hadn't been as much opportunity to practice her newly discovered abilities as she'd have liked. The college work load was too heavy at present, and she'd learned quickly that investigating the possibilities of a burgeoning psi talent was no casual undertaking. It was full of surprises, not always pleasant ones. She'd have more leisure for that kind of thing by and by.

As for those ripples of energy, they hadn't necessarily been generated in the vicinity of the lake. Chance could have brought them echoing into her awareness from some other area of the planet. In any case, she didn't intend to break her restful mood now by trying to determine their source.

Eyes half shut, knees occasionally nudging the kayak's steering rod a

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little to one side or the other, Telzey watched the tall gray cliffs along the lake front drift slowly closer. She sensed no more psi touches and the momentary experience soon sank to the back of her thoughts. There was a government department called the Psychology Service which demonstrated a paternalistically restrictive attitude toward psis who weren't members of its organization and not inclined to join up. Not long after her telepathic ability began to manifest, she'd discovered that the Service had tagged her, put restraints on her use of psi. She'd worked free of the restraints and maneuvered the Service then into accepting the fact that it would be best all around if she were left alone. It wasn't impossible though that they still had an eye on her, that those psi whispers had been bait designed to draw some reaction from her the Service could study.

Telzey decided not to worry about it. If it had been bait, she hadn't accepted it. Some other day she might, just to see what would happen.

Nobody seemed to be living along the water inlets among the cliffs. Campers might be there in summer. Tall trees stood gathered above the shelving rocks, and there were indications of animal life. They were pleasant, peaceful nooks. The kayak circled through each in turn, emerged, glided on along the cliffs to the next. So far, Telzey hadn't seen one that evoked the urge to explore.

But this, she thought, might be it.

Cup-shaped and considerably larger than most, the bay was enclosed by great steep rock walls on both sides. Trees rose above a sandy shore ahead, their ranks stretching far back into a cleft in the mountain. It would be easy to beach the kayak here and get out.

She saw someone lying on the sand then, not far above the water. A motionless figure, face down, feet turned toward her. There was no boat in sight, but an aircar might be parked back among the trees. What seemed immediately wrong was that the man wasn't dressed for a sprawl on the sand. He was wearing city clothes, an orange and white business suit. She had the impression he might be sick or dead—or stoned and sleeping it off.

She sent the kayak gliding closer to shore. Thirty feet away, she stopped, called out to the figure, "Hello there! Are you all right?"

He wasn't dead, at any rate. At the sound of her voice, his body jerked; then he was up on hands and knees, staring around at the trees clustered along the bank above him.

"I'm out here!" Telzey called.

He turned his head, saw her, got to his feet. Brushing sand from his coat, he started down toward the water's edge. Telzey saw his mouth working silently. Something certainly was wrong with that man!

"Are you sick?" she asked him. "You were lying there so quietly."

He looked distressed. But he shook his head, tried to smile.

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"No," he said. "I'm quite all right. Thank you very much for your concern. It's good of you. But . . . well, I'd rather be by myself." He tried to smile again.

Telzey hesitated. His voice indicated he was neither drunk nor doped. "You're sure you're all right?" she said. "You don't look well."

"No, I'm perfectly all right. Please do go now! This isn't . . . well, it simply isn't a good place for a young girl to be."

Scared, she decided suddenly. Badly scared. Of what? She glanced over toward the silent trees, said, "Why don't you come with me then? The kayak will carry two."

"No, I can't. I—"

Great electric surges all about and through her—a violent burst of psi. And a rushing, grinding noise overhead. Something struck the water with a heavy splash ten feet away. Telzey jammed the acceleration button full down, swung the steering rod far over. The kayak darted forward, curving to the left. Another splash beside the boat. This time Telzey was drenched with water, momentarily blinded by it.

The bulk of the rock slide hit the surface of the bay instants later. She was clear of it by then, rushing along parallel to the shore. She shook water from her eyes, stabbed the brake button.

The kayak slammed against something just beneath the surface, spun sideways with a rending sound, overturned, pitching her into the water.

The kayak was a total loss. Face submerged, she could see it from the shifting surface, twenty feet down in the clear dark depth of the bay where it had slid after tearing itself open almost from bow to stern along a projecting ledge of rock. Feeling weak with shock, she lifted her head, stroked through angrily tossing water toward the shore where the man stood watching her. Presently she found a sloping sand bar underfoot, waded out.

"I'm so sorry!" he said, white-faced. "You aren't hurt, are you?"

Telzey's legs were trembling. She said, not too steadily, "Just scared to death!"

"I would have come to your help—but I can't swim!" He looked haggard enough but must be considerably younger than he'd seemed from the kayak, probably not much over thirty.

"Well, I can," Telzey said. "So that was all right!" She gave him a brief reassuring smile, wondering a good deal about him now, looked up at the cliff on her right, saw the fresh scar there in the overhanging wall a hundred and fifty feet up.

"That was a mess of rock that came down!" she remarked, pushing her hands back over her hair, squeezing water out of it.

"It was terrible! Terrible!" The man sighed heavily. "I . . . well, I have towels and clothing articles back there. Perhaps you could find

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something you could use if you'd like to dry and change."

"No, thanks," Telzey said. "My clothes are waterproofed. I'll be dry again in no time. You don't happen to have a boat around, do you? Or an aircar?"

He shook his head. "I'm afraid not. Neither."

She considered it, and him. "You live here?"

He said hesitantly, "No. Not exactly. But I'd planned to stay here a while." He paused. "The truth is, I did use a boat to come across the lake from the village this morning. But after I'd unloaded my supplies and equipment, I destroyed the boat. I didn't want to be tempted to leave too quickly again—"

He cleared his throat, looking as if he badly wanted to go on but couldn't quite bring himself to it.

"Well," Telzey said blandly, "it doesn't really matter. If I'm not back with the kayak by dark, the resort people will figure I'm having a problem and start looking for me."

The man seemed to reach a decision. "I don't want to alarm you, Miss—"

"I'm Telzey Amberdon."

He said his name was Dal Axwen. "There's something I must tell you. While you're here, we'll have to be very careful. Or something may happen to you."

She said cautiously, "What might happen to me?"

He grimaced. "I haven't the faintest idea—that's what makes it so difficult! I do know you're in danger." He cleared his throat again. "I'm sure this will sound as if I'm out of my mind. But the fact is—I'm being haunted!"

Something shivered over Telzey's skin. "Haunted by what?" she asked.

Dal Axwen shook his head. "I can't say. He . . . well, that's why I came here today. I thought I might have escaped from him and that if I stayed hidden long enough, he'd stop looking for me and go away. But he found me—and it's worse now than it was. He never tried to kill anyone before."

Telzey said after a moment, "You don't think that rock fall was an accident?"

"No," he said. "It wasn't an accident. I didn't think he would go that far, but you can see why I wanted you to go away immediately. I hope I'm not alarming you too much. If we stay close together and are very alert until somebody comes to take you back across the lake, everything should still be all right."

He didn't sound convinced of it. Telzey said, "He wasn't trying to get at you with the rocks?"

Axwen shook his head. "He intends to destroy me. Everything indicates it. But not directly—not physically. If he wanted that, he'd have done it by now. There's nothing I could have done to prevent it."

Telzey was silent. At the instant she'd felt that eruption of energy, a tight protective screen of psi force

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had closed about her mind. While Axwen was talking she'd lightened it carefully, gradually. And now that she was looking for indications of that kind, she could tell there was something around on the psi level. A mentality. She had the impression it was aware of her, though it wasn't reacting in any way to the thinning of her screen. Otherwise, she couldn't make out much about it as yet.

She looked at Axwen. He was watching her with a kind of anxious intentness.

"You say you don't know what he is?" she asked. "Haven't you seen him?"

Axwen hesitated, then said wonderingly, "Why, I think you believe me!"

"Oh, I believe you, all right," Telzey said. "Those rocks were up there, part of the mountain, a long, long time! It really seems more likely something started them down on purpose at the moment I was under them than that it just happened."

"Perhaps it's because you're still almost a child," Axwen said, nodding. "But it's a relief in itself to find someone who accepts my explanation for these occurrences." He looked up at the cliff and shivered. "He's never done anything so completely terrifying before! But it's been bad enough."

"You've no idea at all who's doing it?" Telzey asked.

"He's something that can't be seen," Axwen said earnestly. "An evil spirit! I don't know what drew him to me, but he's selected me as his victim. I've given up any hope of ever being free of him again."

An electric tingling began about Telzey's screen. The psi mentality was active again, though on a relatively minor level. Her gaze shifted past Axwen's shoulder. Thirty feet farther along the shore, sand swirled up and about silently as if more and more of it were being flung high into the air by shifting violent blasts of wind in this wind-still bay. Then the sand cloud collapsed. Falling, it seemed to outline for a moment a squat ugly figure moving toward them. Then it was gone.

All right, I'm already scared, Telzey told the psi awareness mentally. *You don't have to work at it.*

She sensed no response, no reaction whatever.

Couldn't it hear her?

She moistened her lips, puzzled, looked up at Dal Axwen's worried, sad face.

"Let's walk around in the open a bit while I dry off," she suggested. "How did all this get started?"

Axwen couldn't say precisely when his troubles had begun. There'd been scattered occurrences in the past few years which in retrospect indicated it was developing during that period. He was an attorney; and sometimes at his office, sometimes at home, he'd discover small articles had been displaced, were lying where he hadn't left

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them. It seemed inexplicable, particularly when they happened to be objects he'd been handling perhaps only moments before. Once he found a stack of papers strewn about the carpet as if by a sudden gust of wind, in a room into which no wind could have penetrated.

"It was mystifying, of course," he said. "But those events were quite infrequent, and I didn't really think too much about them. They didn't seem important enough. Then one night a door started slamming in my home. That was half a year ago."

He lived alone, and was awakened from sleep by the sound of the door slamming loudly shut. Startled, thinking it might be a prowler, though the house supposedly was prowler-proof, he went to investigate. The door was one which normally stood open. He opened it again, went on through the rest of the house, found no indications of an intruder or anything else to explain what could have caused the door to close with such vehemence, and went back to bed. Half an hour later, the door once more slammed shut. This time, Axwen left it closed, or thought he did. Nevertheless, shortly before morning, he was awakened for the third time by the slamming of the door.

It was a disturbing experience, but the following nights remained quiet. One morning then, Axwen was having a talk in the office with one of his clients, a pompous and self-important man. The discussion was interrupted presently by the fact that each time the client began to speak, there'd be several loud thumps in the walls of the office. Axwen apologized but could offer no satisfactory explanation for the continuing interference, and the client soon left.

That was the first of a series of events which gained Dal Axwen the reputation of being an ingeniously offensive practical joker. The next victim was a lady distinguished by a towering coiffure, with whom he was trying to reach an amicable settlement on behalf of a client. He had almost achieved his purpose when the coiffure blew off. "It was exactly as if a blast of wind had lifted it from her head," Axwen said. Without it, she was quite bald, and there were several other people present. She left in a fury, and Axwen lost his client.

His practice declined rapidly in the following months. There were periods in which nothing happened, but he never knew when a previously solid chair might collapse under somebody whose goodwill was essential to him, or other even more disconcerting things would occur. At home, he was no happier. He began to wake up at night to hear somebody walking heavily about the room. When he turned on the light, the footsteps stopped and no one was there. He took to sleeping with every part of the house well illuminated, but assorted manifestations continued. His office staff presently came in for its share of mystifying and alarming experiences and

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deserted him. Replacements didn't last long. His reduced business required less attention, but he did need at least one qualified helper.

In desperation, he advertised for a strong-nerved, adventurous person who could do secretarial work. Since he was offering four times the standard salary by then, there were numerous applicants. Axwen believed in being honest and explained to each precisely what could be expected. Most of them departed quietly before he'd got very far. But one bold and muscular female, who'd been a policewoman for fifteen years, decided to give it a try. At the end of her first day at work, she admitted to having had a few queasy moments though she couldn't say exactly what had caused them. Axwen heard her come into the outer office to start work next morning. She seemed in good spirits. A minute or two later, he heard a scream and the slamming of the entry door. He rushed out, found his new secretary-receptionist had left.

"I called her at her home that morning," he said. "She wouldn't tell me what had happened but stated she wouldn't come back to work for me at any salary. And she refused to talk to me again. I didn't try to replace her. It didn't really seem to matter. My business was almost nonexistent anyway. I feel he's out to destroy me, and he may have nearly succeeded. I'm a religious man, but I've thought several times of doing away with myself.

"That was only a few days ago. I haven't been back to the office since. He didn't make himself too noticeable, as if satisfied for the moment with what he'd accomplished. But last night at my home there was a continuing series of disturbances—enough to make it impossible for me to get to sleep. It was as if he'd decided to drive me out of my mind. Finally I drugged myself heavily and fell asleep almost at once. I slept for a full twelve hours and woke up more refreshed than I'd been in weeks. There were no indications that my persecutor was around. That's when it occurred to me that if I went far away and hid for a while, I might be able to rid myself of him permanently. I acted on the thought at once, picked out this resort at random from a listing, flew up here, bought a boat in the village, loaded it up with camping equipment and supplies, and set out across the lake. This bay seemed ideal for my purpose. Then, when I was beginning to feel almost certain that I was free of him at last, he let me know he'd found me again."

"How did he do that?" Telzey asked.

"I had set up my shelter and was reaching for one of the food containers. It exploded just as I touched it. I wasn't hurt in the least. But I knew what it meant. I could almost hear him laughing at me."

Axwen added, looking dolefully at Telzey, "I don't remember very well what happened most of the rest of

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the day. I was in a state of total despair and fear. I remember lying here on the sand, thinking I might never get up again. Finally I heard you call me."

Some time passed—

Axwen stirred suddenly, lifted his head, and observed in a startled voice, "It seems to be getting dark very quickly!"

Telzey glanced over at him. They were sitting on the sand now, a few feet apart, looking toward the lake beyond the bay. She felt tired and tense. Her face was filmed with sweat. She'd been working around inside Axwen's mind for some while, investigating, probing. Naturally she hadn't let him become aware of what she did.

It had been instructive. She knew by now what manner of entity haunted Axwen, and why he was being haunted. She knew how to end the haunting. The question was whether she could get Axwen to believe her—more specifically whether she could get him to believe her in time to do any good. The haunter wasn't far away, and eager, terribly eager, to destroy her, the psi who seemed to stand between itself and its prey. It had appalling power; she couldn't match it on that direct level. So far, she'd been holding it off with a variety of stratagems. But it was beginning to understand what she did and to discover how to undo the stratagems. It couldn't be too long before she'd find she'd run out of workable defenses.

She didn't know just when the moment would come. So she'd decided to bring Dal Axwen awake again and see how that man would respond now to a logical presentation of the facts. She didn't expect he'd respond too well, but she had to try to get his help while it was still possible.

Axwen then had come awake and made his puzzled comment on the apparent shortness of the day.

Telzey said, "I guess it's just turning evening at the normal time for this latitude and season."

Axwen looked at his watch. "You're right," he admitted. "Strange—the last two hours seem to have passed like a dream! I recall almost nothing of what we said and did." He shook his head. "So I seem to be losing my memory, too! Well, at least there've been no further manifestations." He glanced at Telzey in sudden question. "Or have there been?"

"No," Telzey said.

Axwen yawned comfortably, gazing over at her.

"It's curious!" he remarked. "I feel very calm now, quite undisturbed. I'm aware of my predicament and really see no way out. And I'm concerned that you may come to harm before you're away from here. At the same time, I seem almost completely detached from those problems."

Telzey said, "Mr. Axwen, what do you think of psis?"

He frowned slightly. "Psis?"

"People who read other people's minds," Telzey said. "Or they may

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be aware of something happening far away from them, or predict the future. That sort of thing. Sometimes they're also supposed to be able to move objects around just by thinking about it."

Axwen said judiciously, "I'd discount almost all of those reports as having no provable basis in fact. However, when something of the sort does appear to occur, I believe the so-called psis are unfortunates who have become the playthings of a supernatural agency. My own experience certainly seems to support that view."

Telzey said, "You don't think people should investigate matters like that too closely?"

"I don't," Axwen agreed. "Experimenters intrude on dangerous ground. At best, they're wasting their time. Beyond that, they're exposing themselves to mental and spiritual harm."

Telzey nodded. "Well, that's one thing," she said. "Then there's another thing. You try to be a good man, don't you?"

He looked at her. "I try to be, certainly."

"You never get angry at anyone?"

Axwen shook his head. "You're a strange young person! However, it seems I don't mind discussing my private views with you. No, I don't approve of anger. It's in conflict with my beliefs and philosophy. When I feel such an impulse, which isn't often, I'm almost always able to overcome it. If I can't overcome it, then at least I won't express it or act on it."

Telzey nodded again. "All right. Now some college psychology. Take someone who has about the average amount of human meanness in him. He knows it's not good, and he's trained himself, much more carefully than the average man, not to let it show in what he says or does. In fact, he's trained himself to the point where he usually doesn't even feel it. You remember that sometimes they find that someone who's pushed part of himself down out of sight develops a second personality? One that's more or less made up of what he's tried to bury?"

Axwen said uncertainly, "This discussion is beginning to be rather confusing."

"Let's get back to the first thing then," Telzey said. "Mr. Axwen, there are human psis, and they don't have anything to do with supernatural agencies. I'm one. It's been only a few months since I found it out, and I'm not too good at it yet. But I can read people's minds if I'll take the time and trouble. I've been studying your mind for almost the past two hours, and I know as much as I have to know about you now."

He laughed shakily. "Under the circumstances," he remarked, "I find your fancies a little disturbing! Of course, they are only fancies."

"A couple of things happened when you were ten years old," Telzey said. She went on talking a min-

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ute or two. Axwen's face grew strained as he listened. She said then, "I might have hypnotized you a while ago, or given you a spray of dope and asked you questions and told you to forget them again. But you'd better believe I know what I just told you because I read your mind. It isn't all I've done either. You've felt calm and detached till now because that's how I arranged it. I've been keeping you calm and detached. I don't want you to get any more upset than we can help." She added, "I'm afraid you're going to be pretty upset anyway!"

Axwen stared at her. "About what?"

"The fact that you have the kind of second personality I was talking about," Telzey said.

His eyelids flickered for a moment, and his jaw muscles went tight. He said nothing.

"Let me tell you about him," Telzey went on. "He's the things you haven't wanted to be consciously. That's about it. The way most people would look at it, it didn't make him very evil. But he's known what he is for quite a time, and he knows about you. You're the controlling personality. He's been locked away, unable to do anything except watch what you do. And he wasn't even always able to do that. He hasn't liked it, and he doesn't like you. You're his jailer. He's wanted to be the controlling personality and have it the other way around."

Axwen sighed. "Please don't talk like that!" he said mildly. "I know the theory you refer to. It has nothing to do with, well, anything at present." He considered, added, "However, if I did have such a secondary personality as a result of having purged myself of characteristics of which I couldn't approve, I agree that I'd keep it locked away! The baser side of our nature, whatever form it takes, shouldn't be permitted to emerge while we can prevent it."

"Well, things have been changing there," Telzey said. "You see, Mr. Axwen, you're a psi, too."

He was silent a moment, eyes fixed on her. Then he shook his head slowly.

"I would have preferred not to mention it," he said, "but it's obvious that the situation here has unsettled you temporarily. That's quite understandable. However, it won't be long before someone comes to take you away; and you're young and resilient. It shouldn't be long before you're free of any ill effects of this experience."

"You don't believe you're a psi?" Telzey said.

"I'm afraid I don't." Axwen half smiled. "I'll admit that for a moment you almost had me believing you were one!"

Telzey nodded. "That's how the real trouble started," she said. "You didn't want to believe it. You should have realized a few years ago that you were beginning to develop psi abilities and could control them. But

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it frightened you. It wouldn't fit in at all with your beliefs and philosophy. So that was something else you pushed out of awareness." She added, "These last few months I've noticed other people doing the same thing. Usually it doesn't matter—there isn't enough ability there anyway to make much difference."

"Then why should it make any difference to me?" Axwen said gently.

Telzey didn't reply immediately. That gentleness overlay a mental rigidity strained to the breaking point. Axwen could hardly have avoided having uneasy intimations by now of what she was leading him to. But he still wouldn't let himself see it; and if the barriers against understanding he'd developed over the years were to be broken down, he'd have to do it himself—immediately. His personality was too brittle, too near collapse under pressure as it was, to be tampered with at this point by a psi—certainly by a psi whose experience was no more extensive than her own.

Just now, in any case, she'd have no time at all for doubtful experiments . . .

She thought Axwen should be able to meet the demands that would be made on him. She'd prepared him as well as she could. What was left was to show him the unalterable and compelling factors at work here, exactly as they were.

"I never heard of a psi with anything like your potential in some areas, Mr. Axwen," she told him. "I didn't know it was possible. You've shoved control of all that power over to your other personality. He's been learning how to use it."

Axwen made a sudden ragged breathing noise.

"So he's who has been haunting you this past half year," she went on. "Really, of course, you've been haunting yourself."

If it hadn't been for the careful preliminary work she'd done on him, Axwen's reaction, when it finally came, might have been shattering. As it was, she was able to handle it well enough. Some five minutes later, he said dully, "Why would he do such a thing to me?"

It was progress. He'd accepted one part of the situation. He might now be willing to accept the remaining, all-important part. "You said you thought he was trying to drive you out of your mind," Telzey said. "He is, in a way. After he's reduced you down to where you can barely think, *he'll* be the controlling personality."

Axwen said, in desperation, "Then he'll succeed! I can't hope to stand up against his persecution much longer!"

"You won't have to," Telzey told him.

He looked at her. "What do you mean?"

Telzey said, "I've checked this very carefully. You can take psi control away from him if you'll do it at once. I can show you how to do it

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and help you do it. I know people I could send you to who could help you better than I, but we haven't nearly enough time left for that. And we can do it. Then—"

"What you're saying is completely repugnant to me!" Renewed shock distorted Axwen's face. "I will not assume control of any such ability!"

Telzey looked at him.

"You won't have to keep it if you don't want it," she explained. "You do have to control it first. Then you can step it down or go nonpsi. People do that sometimes. But whatever you decide about psi, you'll have to start turning your other personality back to being part of you. He really is part of you anyway, of course. But he has to be something you know about and can work with. Otherwise you'll have trouble with him the rest of your life."

Axwen's jaw had begun to tremble; his eyes rolled like those of a frightened animal. "I will not associate myself with whatever that creature has become," he said hoarsely. "I deny that he's still part of me!"

Telzey pushed her palm across her forehead, wiped away sweat.

"Mr. Axwen," she said, "let me tell you some more about him, about the situation. I'll talk about him as if he weren't really you. He's one kind of psi; I'm another. In a way, he's much stronger than I am. I couldn't begin to tap the kind of energies he's been handling here, and if I could, they'd kill me. But since he started to develop his abilities, he's given all his attention to working up his fright campaign against you. He makes noises, moves things, throws them around, breaks them. He creates effects in the world outside. He thought that was what psi was for, and until today he didn't know there were other ways of using it. There's a lot he doesn't understand. I'm the first psi he met—he didn't know there were others. He thought I was dangerous to him, so he tried to kill me, his way.

"I can't do any of the things he does. What I've done mainly when I had the time was study minds. What they're like, what you can do with them. Like I studied you today—and him. He didn't know I was doing it for a while, and when he knew that he didn't know how to stop me. There haven't been any more of those manifestations because I didn't let him produce them. He's been trying to do things that will kill me. But each time I confuse him, or make him forget what he wants to do, or how to do it. Sometimes he even forgets for a while that we're here, or what he is. I'm holding him down in a lot of different ways.

"But he keeps on trying to get away—and he *is* tremendously strong. If I lose control of him completely, he'll kill me at once. He's drawn in much more energy to use against me than he can handle safely—he still doesn't know enough about things like that. He's trying to find out how I'm holding him, and

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he's catching on. I can't talk to him because he can't hear me. If I had the time, I think I could get him to understand, but I won't have the time. I simply can't hold him that long. Mr. Axwen, don't you see that you *must* take control? I'll help you, and you can do it–I promise you that!"

"No." There was the flat finality of despair in the word. "But there is something I can do . . ."

Axwen started climbing to his feet, dropped awkwardly back again.

"That would be stupid," Telzey said.

He stared at her. "You stopped me!"

"I'm not letting you dive into the bay and drown yourself!"

"What else is left?" He was still staring at her, face chalk-white. His eyes widened then, slowly and enormously. "*You*–"

Telzey clamped down on the new horror exploding in him.

"No, I'm *not* some supernatural thing!" she said quickly. "I haven't come here to trick you into spiritual destruction. I'm *not* what's been haunting you!"

Something else slipped partly from her control then. Far back in the forested cleft behind them, high up between the cliffs, there was a sound like an echoing crash of thunder. Electric currents whirled about her.

"What's that?" Axwen gasped.

"He's got away." Telzey drew a long unsteady breath. "He doesn't know exactly where we are, but he's looking for us."

She blotted consciousness from Axwen's mind. He slumped over, lay on his side, knees drawn up toward his chest.

She couldn't blot consciousness so easily from the other personality. Nor could she restore the controls it had broken. The crashing sounds moved down through the cleft toward them. There was one thing left she could do, if she still had time for it.

She drew a blur of forgetfulness across its awareness of her, across its purpose. The noise stopped. For the moment, the personality was checked. Not for long–it knew what was being done to it in that respect now and would start forcing its way out of the mental fog.

Psi slashed delicately at its structure. It was an attack it could have blocked with a fraction of the power available to it. But it didn't know how to block it, or, as yet, that it was being attacked. Something separated. A small part of the personality vanished. A small part of its swollen stores of psi vanished with it.

She went on destructuring Dal Axwen's other personality. It wasn't pleasant work. Sometimes it didn't know what was happening. Sometimes it knew and struggled with horrid tenacity against further disintegration. She worked very quickly because, for a while, it still could have killed her easily if it had dis-

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covered in this emergency one of the ways to do it. Then, presently, she was past that point. Its remnants went unwillingly, still clinging to shreds of awareness, but no longer trying to resist otherwise. That seemed to make it worse.

It took perhaps half an hour in all. The last of Axwen's buried personality was gone then, and the last of the psi energy it had drawn into itself had drained harmlessly away. Telzey checked carefully to make sure of it. Then she swallowed twice, and was sick. Afterwards, she rinsed her mouth at the water's edge, came back and brought Axwen awake.

A search boat from the resort village picked them up an hour later. The resort had considerable experience in locating guests who went off on the lake by themselves and got into difficulties. Shortly before midnight, Telzey was in her aircar, on the way back to Pehanron College. All inclination to spend the rest of the weekend at the lake had left her.

The past hours had brought her an abrupt new understanding of the people of the Psychology Service and their ways. Dal Axwen was a psi who should have been kept under observation and restraint while specialists dissolved the rigid blocks which prevented him from giving sane consideration to his emerging talent. If the Service people had discovered him in time, they could have saved him intact, as she'd been unable to do. And there might be many more psi personalities than she'd assumed who could be serious problems to themselves and others unless given guidance—with or without their consent.

It seemed then that in a society in which psis were a factor, something like the Psychology Service was necessary. Their procedures weren't as arbitrary as they'd appeared to her. She'd keep her independence of them; she'd earned that by establishing she could maintain it. But it would be foolish to turn her back completely on the vast stores of knowledge and experience represented by the Service . . .

Her reflections kept returning unwillingly to Dal Axwen's reactions. He'd been enormously, incredulously grateful after she restored him to consciousness. He'd laughed and cried. He'd kept trying to explain how free, relaxed and light he felt after the months of growing nightmare oppression, how safe he knew he was now from further uncanny problems of the kind. Forgetting she still was able to read his mind, knew exactly how he felt—

Telzey shook her head. She'd killed half a unique human being, destroyed a human psi potential greater than she'd suspected existed.

And Axwen—foolish, emptied Axwen—had thanked her with happy tears streaming from his eyes for doing it to him!

She sighed. It wasn't going to be at all easy sometimes, being a psi. ■

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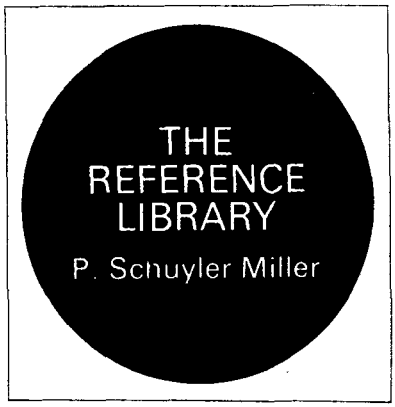

FIVE FROM ALL OVER

Increasingly, as you may have discovered if you read book ads or other reviews than these, "mainstream" writers are discovering science-fiction themes and using them in "respectable" books. In most cases, the internal evidence suggests that they know nothing about science fiction, see no reason to separate it from fantasy, and consider themselves tremendously original to have hatched such ideas. So do the critics and reviewers who read them.

A great many of these outside writers are American, and I apologize for not keeping up with them better. (Some I may pick up yet as paperbacks.) But in the last few months we have had five examples of mainstream science fiction from as many countries—France, Sweden, Russia, Japan and England—which I happen to have read all together and can report on here.

"The Ice People," by Rene Barjavel (William Morrow & Co., New York; 1971; 205 pp.; $5.95) has allegedly been the Number One best seller in France. Some American reviewers have hurried to get on the bandwagon without realizing that they are reading conventional science fiction . . . and SF of the old *Planet Stories* or even *Argosy All-Story* formula at that. It's smoothly enough done and full of color, but you'll find it very familiar. The ruined city of a pre-Pleistocene civilization, half a billion years old, is found under the ice at the South Pole. An international committee digs it up and finds a sealed golden sphere with a man and a woman in it, preserved at the temperature of solid helium. They are thawed out, and in flashbacks we get the story of the downfall of their society through nuclear war, while behind the scenes agents of assorted present governments are trying to steal the secrets of their science, or at least keep anyone else from getting them.

There could hardly be a greater contrast than that between "The Ice People" and "Notes from the Future," by Nikolai Amisoff (Simon and Schuster, New York; 1970; 384 pp.; $6.95). Professor Amisoff is a distinguished Soviet surgeon, and his book is a true novel—a portrait of a Russian physiologist, plodding along in Amisoff's own field, who learns that he has leukemia and decides to have his research team preserve him by anabiosis—deep freezing—until such a time as he can be awakened

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and cured. The first half of the book is an almost documentary account of the development of the computer-controlled anabiotic "sarcophagus" in which Ivan Prokhoroff will be preserved. Written with the author's special knowledge of medical problems, it makes the current proposals for frozen survival seem silly.

The last half is Prokhoroff's journal of his wanderings through the world of thirty years from now, where he has no real place and is not even much of a curiosity. In this, he is gentler than most American writers would be. He finds New York frenetic and gadget-ridden . . . a bit odd for having no "official ideology" to direct its efforts away from waste. Columbia University scientists are working on the chemistry of contentedness, in the hope of achieving an even blander society. Japan has become "just like anywhere else," but the Japanese have the world's most developed cybernetic brain, and their society seems to be the one that the author admires most. Since Russian society is planned along socialist lines, the Soviet intellectual world of 1991 is not much different from the world where Prokhoroff went to sleep. Solid—perhaps you would say stolid, like its hero—"Notes from the Future" are to be taken seriously.

Japanese novelist Kobo Abé, in "Inter Ice Age 4" (Alfred A. Knopf, New York; 1970; 228 pp.; $5.95) also paints the portrait of a scientist, but its anti-hero, Dr. Katsumi, is a more neurotic sort than Professor Prokhoroff. He is also a second-string scientist, trying to make a bureaucratic name for himself by developing a computer that can predict the future. His efforts to find a human subject for his experiments involve him in a murder and a wheels-within-wheels mystery that is nicely developed, though in a direction that will not surprise Analog readers. For the forces behind the scenes of all that happens to him are a group of molecular biologists who foresee the drowning out of the world's major cities by rising seas, and who are developing a new race of amphibious humans to live in the deeps. Oddly, Katsumi might be the originator of the humanoid cybernetic computer in "Notes from the Future." He is a recognizable type, just as Prokhoroff is—every nation has them. The story is as lively as "The Ice People," but a lot more believable once you get past the distracting style that the author uses to impress his narrator's prickly personality on you.

Per Wahloo is a Swedish writer who collaborates with his wife on an excellent series of underplayed procedural detective stories. On his own, and now as "Peter" Wahloo, he writes political mysteries about another Swedish police officer, Chief Inspector Peter Jensen, living in the Stockholm of the next century or so. The first Jensen book, "The Thirty-First Floor," was far better than the new one, "The Steel Spring," though

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this book goes in for more showy effects. Jensen is out of his unnamed country for an operation. When he recovers, he finds the borders closed, his homeland without water, power, or many people. The police seem to have vanished and a secret police to have taken over. Thousands of people have apparently died in a plague that has swept the country, and a group of doctors are under siege in a central stronghold. Gradually Jensen digs out what has happened, who is responsible, and why it happened—a reason that grows out of the current struggle between hard-nosed capitalism and the Welfare State, of which we feel Sweden is typical.

I should probably have held out Colin Wilson's "The Philosopher's Stone" (Crown Publishers, New York; 1971; 315 pp.; $5.95) because it doesn't really belong in the company of the other four. Wilson is an English novelist and essayist who enjoys science fiction—though he seems to like some forms of fantasy more—and has written some. This book is his answer to a challenge from August Derleth, to write a modern novel in the genre of the late H. P. Lovecraft. And this he has done very effectively, though without employing Lovecraft's intentionally archaic style. In particular, he has used the Lovecraftian technique of bolstering his plot and his arguments with lavish citations from all sorts of philosophers, occultists and mystics—except that Wilson has drawn on real writers, in most cases, instead of on Lovecraft's invented authorities.

His narrator, Howard Lester—*not* Newman, as the jacket has it—is a dilettante scholar and antiquarian who discovers a technique of mental time-travel. He and a friend investigate a scandal of Shakespeare's time—including strong indications that Bacon wrote the plays—lay a few ghosts, raise some unexpected ghosts at Stonehenge, and soon find themselves on the trail of none other than Lovecraft's Great Old Ones, the unhuman beings from the dawn of time who created men from retarded apes, who raised Mu and let it crash again, and who sleep on in cyclopean cities deep in the bowels of the Earth. The book constructs a rational framework which draws Lovecraft's stories into the fringes of science fiction—where others, admittedly, have argued they belong because of Lovecraft's factual manner of constructing his "supernatural" marvels.

I guess that I really appended "The Philosopher's Stone" to this discussion in order to quote a phrase from early in the book: "Man is not really himself unless he is contemplating immense vistas." Surely this is the nucleus of the "sense of wonder" that some feel is the essence of science fiction. It is the common element that ties an incredibly disparate variety of writing together, from Wells to Stapledon to "Doc" Smith to Samuel Delaney to many of the other moderns. These books,

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from the five corners of the world, show that we still find these immense vistas hypnotic and inspiring.

AUSTRALIAN SCIENCE FICTION INDEX: 1925-1967

Compiled by Graham Stone Australian Science Fiction Association, P.O. Box 852, Canberra City, ACT 2601. • 158 pp. • In the U.S., F & SF Book Co., Box 415, Staten Island, N.Y. 10302. • $3.50.

So you didn't know the Australians published science fiction? Real old-timers will remember—or remember hearing about—Erle Cox's "Out of the Silence." Readers of this and other current magazines certainly know A. Bertram Chandler of the Rim Stars. But this is an index to books and magazines published *in* Australia by Australian publishers—for the most part.

Ever hear of *Thrills Incorporated? Selected Science Fiction? Science-Fiction Monthly? American Science Fiction? Fantasy Fiction? Scientific Thriller? Science Fiction Library? Satellite Series?*

You may have known that *F&SF* had a short-lived Australian edition—14 issues—but did you know that *Orbit* tried it for one issue in 1954—labeled "No. 10"? That there were Australian magazines called *Future Science Fiction* and *Popular Science Fiction* made up of stories gleaned from all over? That a book credited to one author, under one title, may be larded out with stories by other authors?

My one disappointment is that Paul Linebarger, who wrote as "Cordwainer Smith" and who taught in Australia, loved it, and distilled it into his unique stories, never published in any of the Australian magazines.

NIGHTMARE AGE

Edited by Frederik Pohl • Ballantine Books, New York. • No. 02044. 312pp. • 95¢

This is a theme anthology, but not—though it opens with a semi-fictional projection by environmentalist Paul Ehrlich—an environmental anthology. At least, not in the Earth Day sense of environmentalism, though all of the thirteen stories do extrapolate trends we can see in our own social and physical environment.

You'll remember some of them. You remember C. M. Kornbluth's "The Marching Morons," breeding like rabbits and driving the median IQ down and down and down, while the mentally elite try to hold society together. You remember his "Luckiest Man in Denv," who lucked into a situation that would make his boss forever grateful and guarantee his status as an upper-floor comer—though not quite as the books recommend. You remember Pohl's own "Midas Plague," with its harassed young hero who found a way to beat the system and cut down on his hapless fight to maintain the GNP. You certainly remember Robert Heinlein's "Year of the Jackpot," when

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all the cycles peaked at once and the world came to an end. You may remember Mack Reynolds' "Among the Bad Baboons"—only two years old—with its pigheaded young artist-hero scavenging the ruins of an abandoned Manhattan, while the "baboons" and the hunters scavenge him.

But what about Christopher Anvil's "Uncalculated Risk"? It was here in Analog in 1962—the one in which a soil-texturing agent proves far too efficient. What about Kris Neville's "New Applies in the Garden"—it was here too, a year later? It's the most realistic—and the scariest—story in the book. Can it be true that potholes are forever? Will water ever be drinkable? Will there ever be fish without mercury? Is it already the year, or the decade, of the jackpot?

Fritz Leiber's "A Bad Day for Sales" is another familiar one; I should have included it a couple of paragraphs back. Remember the sales robot that goes right on doing its thing when the bombs begin to fall? Less familiar, and even grimmer, is "X Marks the Pedwalk," in which the battle between motorists and pedestrians comes into the open. That's Leiber, too. Kenneth Bulmer's "Station HR972" can be considered a further extrapolation to the time when the motorists have won out.

Afraid of muggers? Vandals? Trashing? Clifford Simak's "Day of Truce"—a completely atypical story, if you think him the epitome of the future-pastoral—brings the war of the classes and the generations into the open, too. Finally—though it comes quite early in the book—Pohl also has "The Census Takers." In 1970 we had an unusual number of people—hippies, fundamentalists, militant blacks—who refused to be counted on ideological grounds. But will there be a time when the census has another purpose? When it solves the problem of the population explosion, instead of merely documenting it?

One of the functions of good science fiction is to disturb as well as to entertain. Familiar though most of the stories in "Nightmare Age" are, they should do that quite effectively. Read it—and look around you.

CHRONOCULES

By D. G. Compton • Ace Books, New York. • Special No. 10480. • 255 pp. • 75¢

They haven't all been world-beaters, but I think it is safe to say you can read any Ace Special and not be sorry. That, of course, is why they put the "Special" label on them.

This one is a time-travel story that is quite different from any other time-travel story I can remember. It's English, and the setting is unmistakably so—he says, having never been east of Maine except in books. It has an anti-hero who is a moron, and a delightful anti-heroine who is a vicious bitch. It has a tycoon right out of the handbooks, who is paying

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an enclave of scientists and bureaucrats a fortune to invent time-travel, so he can escape into the future—and hopefully become immortal there—before society blows up in his face. You have the aforesaid decaying society, English variety, as lovingly sketched in as Heinlein used to do it. And you have all the melodrama one book can reasonably supply—espionage, murder, riots, rape—plus a nice little mystery. You have a reasonable sprinkling of four-letter words and three-letter activities, never for the moment dragged in because the formula calls for tuppence worth of sex and sensationalism right about there.

You have all this, but what you really have is the makings of a novel about what happens to the people involved in the ingrown, inbred, incestuous imitation village which masquerades as Penheniot, as they struggle under incessant pressure from the not-at-all-senile Founder and from the executives he has selected to keep his cart moving into the future.

James Blish liked it, too. He says so on the back. That probably means it's good, because he never likes anything without reasons to back him up.

ONE MILLION TOMORROWS
By Bob Shaw • Ace • Special No. 62938. • 191 pp. • 75¢

This one isn't as "special" as most in this outstanding Ace series. It's a good enough story—you should know Bob Shaw's work well enough to be sure of that—but it doesn't measure up to some of their others.

Shaw begins by sketching in a future society that promises to be as fascinating as some Robert Heinlein has constructed. It is a world where biomedicine has found out how to bestow near-immortality, at a price that helps offset the problem of the population explosion in a world where nobody dies. Men who take immortality shots—bearded, codpieced "funkies" who "tie off" and turn "cool"—also become sterile. Even so, many tie off in their teens or twenties in order to stay forever young. Others have maturity and experience to sell to future employers—though society rotates them back to the lower echelons from time to time. Psychopathic women—as we learn in one grim little scene—may give themselves immortal babies to tend through the centuries.

Will Carewe, forty-year-old Colorado accountant for a top pharmaceutical house, is given the opportunity to take a new drug that will give him immortality without sterilizing him. He takes it under an oath of secrecy—his marriage breaks up—and he promptly finds himself a hunted man, with attempt after attempt on his life. From here in the story develops into a hare-and-hounds mystery, with Carewe sometimes the hare, sometimes a hound. Needless to say, things are not quite what they seem. But the lovely little details—such as frictionless ball bearings—keep pace with the fairly pedestrian plot.

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BRASS TACKS

BRASS TACKS

Dear John:

In reading your March editorial I was reminded of something Nicholas Johnson, the maverick FCC commissioner, wrote in his book "How to Talk Back to Your Television Set." He said that the greatest impact and importance of a Moon landing was not scientific, or technological, but social and philosophical. What phrase is most associated with our space program? You guessed it: "If we can go to the Moon . . . then we can—" Moon landings are boring to most TV viewers, but important for anyone with a social cause to promote. As long as we have Moon landings we will have indignant people calling for reform. Without manned expeditions into space there will be only the mechanical news of the mechanical probes to the distant and unthoughtabout planets, moons, and asteroids. If we stop now then there will be nothing to rail about. How can you complain about improving living conditions for everyone to match the standard of living without pointing out a recent and successful project that required organization, specialization, and teamwork? If there are no Mars expeditions, or space stations, or propulsion experiments in deep space, then there is no right to gripe at home. Your "demands" will be ignored.

There seems to be a parade of reorganizations in government these days. Someone is always saying how some department is unmanageable. But the space program is not unmanageable. It is working. Despite setbacks and delays tangible results are on our TV screens every year. Men have set foot on the Moon in 1969, 1970, and 1971. How many other government groups can claim such success in their own programs? That is, to have achieved something akin to their planned goals? No, NASA must keep up the good work even if it means increased dissent of all kinds—the kind you describe

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from scientists as well as the kind in the streets. We need the more perfect, the more successful model, to keep us going.

JOHN ROBINSON
2 Norwood Street
McKownville, N. Y. 12203

Sir, you have a most excellent point there!

Dear Mr. Campbell:

Re: the cover by Kelly Freas for Robert Chilson's novelette, "Ecological Niche." The following appeared in the November, 1970 issue of the *Reader's Digest* (the Canadian edition), on page 34. It was contributed by William R. Hillinger:

For some time, resistors, condensers and ceramics were missing each morning from trays on the assembly line of the electronics firm I worked for. The company, which made guidance-systems for rockets, was greatly concerned about this loss. Security guards were placed at the entrance to the department, and no one was allowed in the area during the night. Nevertheless, parts continued to vanish. Then one day, maintenance men working in the rafters of the building discovered birds' nests made out of resistors, condensers and ceramics. The estimated cost of this bird-housing project: $1,000 per nest.

Was Mr. Freas aware of this incident when he painted the cover of the December, 1970 Analog? Or is this a matter of prescience? If so, what is the implication concerning some of his more thought-provoking covers? Hm-m-m.

OLAF JANZEN
3 Bounty Bay
St. Catharines
Ontario, Canada

Chilson was right!

Dear Mr. Campbell:

After reading your editorial "The Modern Black Arts" I can only say that I have to both agree with you and disagree. As an anthropologist I feel I should defend the Social Sciences, although specifically psychology and sociology do leave much to be desired.

However, the social sciences can never really become sciences by your definition because when we begin to deal with people, either as single entities or as groups, we are dealing with variation not similarity. People do not obey rational laws, they are not predictable. Culture is, after all, the sum total of all the allowable variations and is consequently rather difficult to deal with. Sometimes I'm surprised at how well these variations are predicted and manipulated by some of the better social scientists.

It also seems to me that man is presently going through a difficult evolutionary period from what we term "culture" to something that is more than this. A "cultural" type of organization was developed by our ancestors as a means of coping with a diversity of environments. Now man is at a stage where he can rather

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effectively control, or artificially adapt to, all environments including such hostile environments as outer space. Culture to begin with, although learned and passed on, has been, until recently, unconscious and beyond the ability of most individuals to tamper with. This is no longer true and man is developing, in western civilization at any rate, cultural experts in control and manipulation, the social scientists.

Traditional culture is no longer necessary and change is being accelerated by artificial means--television is the most important medium of change any culture has developed, its effectiveness to produce constructive change has yet to be proved, but its destructive influence can be seen rather prominently today.

As to the academic harassment of many young people, I can only say that within my own field I have yet to be pushed aside or ignored. I have been allowed a good deal of freedom to use what theory and knowledge I've gained. This is only my personal experience but I'm sure, in general, anthropology tends to encourage rather than discourage participation by the young.

I can also say that often what is taught in the classroom by people with little experience on the outside bears little resemblance to the real world. After fourteen months working on the Navajo Reservation I can safely say that the things I was taught never to do when working with another culture are often the things that get the best, or at least the most immediate, results, while most of the standard approaches don't seem to work for me at all.

Just give us social scientists a chance, we're only beginning to feel our way, but hopefully in time we'll be able to give you the results you want and that hopefully mankind deserves!

CARMIE LYNN TOULOUSE
404 E. Comanche
Farmington, New Mexico 87401

You say "People do not obey rational laws; they are not predictable." To maintain that position is to maintain that human beings are Supernatural entities--natural laws do not apply to them, and there are no laws of human behavior. This is equivalent to saying "People are magical entities; they cannot be dealt with with scientific logic and reason, but only by Magical techniques." That makes the social "sciences" necessarily witchcraft, now and forever, doesn't it?

Either there are laws of human behavior--as yet unknown, but knowable--or they are Supernatural entities and the social Witchcraft must continue.

My position is that the social sciences can come into existence, because there are laws; so far the psychologists and sociologists haven't found them, that's all. Like the alchemists of old, they're trying to use astrology and demonology to make their reactions go, instead of discovering the laws of thermodynamics.

The physical sciences seem easier

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now—because that problem's been cracked. Note that it only took some 2,000 years of investigation to work out the methods of cracking problems, and another 300 of using those methods, to get where physics and chemistry are today. Easy, huh?

Now it's obvious to any thoughtful man that water is a pure substance—it's crystal-clear, colorless . . .

Because centuries of labor cracked the problem you know that it's actually a compound of two elements—and that you've never in your life seen pure water anyway. I doubt that you ever will; it's too good a solvent.

Most of the laws of chemistry are, as the laws of sociology and anthropology must be, based on statistical probabilities. The very simplest inorganic reactions such as $FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$ *really do work that way.* $Fe(OH)_3$ *is so fantastically insoluble that that reaction is 99.999999+% complete. But try getting organic reactions to go 100% or even 50% to a single desired product! It's a series of equilibrium reactions based on statistical probabilities and thermodynamic factors. Just like human social systems!*

But the chemists have sweated out most of their basic problems. The social "scientists" haven't; they've declared human beings to be Supernatural, and Unlawful and Unreasonable instead of digging in, applying a little less arrogance, and finding out what the laws are.

It's much more satisfying to say, "I do not know that, because it is Unknowable," than to say, "I don't know, because I am still ignorant."

You say "Man is presently going through a difficult evolutionary period . . ." When, during the last three thousand megayears, has Man's line not *been going through a "difficult evolutionary period?" That's one of the underlying laws of biodynamics, isn't it? Are you expecting evolution to stop one of these days, stabilize, and make everything easy? Consult your nearest ecologist!*

It's true that modern social "scientists" are indeed monkeying with cultural evolution. I just wanted to call attention to the fact that (1) they don't know what they're talking about; (2) they don't understand the root problems; (3) and won't acknowledge some fairly obvious facts that disagree with their theories. Which makes them much worse for human society than if they'd just go away and let things work out.

In referring to human culture, you can not say "accelerated by artificial means" such as television; television is as natural a part of human culture as his dam is for a beaver. It is *human culture! It wasn't handed to us by visiting aliens, you know.*

Of all the forms of social "sciences," anthropology has seemed to me the most sane; it's largely an observational science—and observers seek to see what is there, not impose what they think should be there.

Evidently you're headed for being a good anthropologist; you don't believe in books and authorities, when their

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pronouncements clearly don't work in the real culture you're studying.

As an anthropologist, you do know that the proposition "you can't experiment with human beings" is false; every human culture men ever devised was an experiment with human beings—whether a mere few score of Lacandon Indians or 800,000,000 Chinese.

For contrast, having studied the Navaho in the west, you might be interested in studying the Brooklyn, N.Y. Indians. They're mostly Mohawks, and they're doing very well, thank you, in fitting into Western Culture. They've beaten out the White Man in his own field—erecting skyscrapers and steel ships!

Dear John:

I don't like to nit-pick, particularly about as good a painting as Freas' cover for the February issue, but it might be helpful to future illustrators to note that Mach diamonds do *not* appear in a rocket jet exhausting into space. You need an atmosphere to intereact with the jet to produce them. No atmosphere, no recompression, no Mach diamonds.

JOHN D. CLARK

Newfoundland, N. J.

Hm-m-m—well, you see it's a pulse-jet type rocket. The Mach diamonds are actually pulse discharges, huh?

Dear Mr. Campbell:

Congratulations!

I just finished reading the editorial in the September edition of Analog and I am glad to see in print what I have been voicing for months.

It's a shame that this editorial has not hit the press wires for national distribution. It should.

I have worked for the last ten years for the simplest survival since I could not afford college when I graduated. I lived in Maryland until very recently and was there when there was trouble at the University of Maryland. I was ashamed of these children—I call them children because they, in fact, act like my four-year-old daughter did two years ago—and their actions and the reactions of press, parents and the like.

Perhaps some day when these children grow up there may be some hope for them; but what chance do they have to grow—mature—when they are not held responsible for their actions?

It is evident that they have never been held responsible for anything and since they are going to college—and now even have the right to vote—how will they ever grow up? What kind of voters will they make when they are so immature? They need a great deal of discipline. Where will they get it? In the home? There, it's a little late for that.

Anyway, congratulations, take care, and keep writing such excellent editorials.

ELIZABETH A. HOLLORAN

P.O. Box 36

Gilberts, Illinois 60136

One wonders how they'll go about raising their *children!*

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EDITORIAL

continued from page 7

My essential point is a simple one: Stop wasting good, well-intentioned efforts on hysterical Causes, and concentrate on areas that are *real* ecological threats.

Get over the idea that the human population can explode from a few millions to multibillions without changing the planet's ecology. There *are* going to be ecological changes, there *have* to be, to make a niche in the system large enough to allow Man to have such a huge population.

The Passenger Pigeon died—sorry, folks, but it had to. It couldn't change its way of life, and its way of life and human agriculture could not coexist. Its way of life involved hundreds of millions of large birds, with large appetites. A human grain field was a natural feeding station—and if half a million birds settle in a field, when they take off, the grain goes with them. That way of life, and human agriculture, simply couldn't coexist. And they were a bird that couldn't reproduce if their flocks were too small. They simply had to die, if Man was to live. And while I like birds, I'm not about to resign in their favor.

The problem is to recognize that there will be changes in the ecology—and see that the changes are limited, and wise and *choices*, not accidents. That there is awareness of what is going on, and what can be done about it.

But not to be so irrational as to say we can preserve America just as it was 500 years ago, while we move some 400,000,000 people in. You can't move a quart of water into a one-pint can without causing some crushing and crowding; don't think you can.

The proper use of energies in the cause of ecology (with a small "c", please; Causes with a large "C" usually mean fanaticism and destruction) is to take a wise, judicious, realistic look at problems, and seek an *optimum* answer. Perfect answers exist only in fairy tales. We're still fighting the locust, which menaces man's agriculture just as the Passenger Pigeon did. Is anyone organizing a Society for the Preservation of Locusts?

The case of DDT represents a very rugged problem. In the first place, it was introduced as a great and important benefit to Mankind—which it most certainly was. Like penicillin however, it proved to have certain unpleasant and totally unexpected side effects. Penicillin turned out to produce violent—sometimes lethal—side effects such as fatal allergy reaction. Also, many of the bacteria that had, at first, been slaughtered wholesale developed immune strains that seemed to like the stuff.

Perhaps the greatest of all benefits penicillin brought to us was its demonstration that such things as antibiotic drugs *could* exist; that started a world-wide search for more, more effective antibiotics that has led to

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the wide variety we have right now.

As the search for antibiotics was started by the discovery of penicillin, so the search for really powerful and effective insecticides was started by the discovery of DDT. Whatever DDT's faults, that stimulus to research was an inestimable boon.

The dazzling success of DDT has led to the development of a host of newer compounds—and, as we learned of the disadvantages of DDT, we knew what to avoid in the new chemicals.

DDT's one real flaw is its extremely long persistence; it doesn't break down in weather. When it was first used, everyone was delighted with the fact that it could be put on the job, and unlike previous substances, it would *stay* on the job. One good spraying of DDT and flies, mosquitoes and similar pests would be killed for the next three to six months. Glory! Glory! We finally had something that would *keep* the flies out of the barn!

It was quite some while before the bad side of that began to be recognized. Not being gods, we don't always know about things nobody ever heard of before. It's fine to yowl about how DDT affects plankton and birds' eggshells, and how "they", without specification as to who "they" are, "should have known better."

What they did know was that DDT, dusted into the clothing of Italian war refugees during WWII stopped very suddenly a lethal epidemic that fleas and lice were spreading.

Now we know that those over-persistent insecticides have their unwholesome aspects, and must be used with caution, until we have something else to use in special situations.

Now let's be realistic and consider one case of the use of DDT. The Island of Ceylon, in 1966, had some 2.8 million deaths due to malaria. The island government launched an all-out campaign to get rid of the mosquitoes that spread the disease in 1967 and 1968, with widespread spraying of DDT. So effective was the campaign that in 1968 the number of deaths due to malaria dropped to 128 individuals!

Since the campaign had effectively wiped out the disease vector, and even DDT is expensive in the quantities they used to cover the island, they relaxed and stopped spraying in 1969.

And in the next year they had 2.5 million deaths due to malaria.

Now, friends, do you think you can get the Ceylonese to accept 2.5 million deaths a year so that our pretty feathered friends can lay hard-shelled eggs? Because the stuff also kills some varieties of the phytoplankton when it washes into the sea—and we're dependent on photosynthetic plankton for most of Earth's oxygen supply?

Sorry—but the Ceylonese individual is dependent on the red cells attacked by malaria plasmodia for his

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very personal internal oxygen supply; the remote danger of planetary oxygen exhaustion doesn't move him very strongly.

Matter of fact, it doesn't move me very strongly either. Agreed, some of the plankton *are* very sensitive to DDT—fantastically so, even more sensitive than flies and mosquitoes. Agreed that we need plankton to oxygenate the seas and the atmosphere. Since the sea represents some 75% of Earth's surface, and it's absorption of solar energy that produces oxygen, clearly the sea is the major source of Earth's oxygen.

However, just as a lot of the bacteria we once slaughtered with penicillin have developed immune strains, and the flies and mosquitoes have developed immune strains that don't mind a little DDT in their diet, it's a pretty safe bet that the plankton will fairly promptly turn up with strains that can digest DDT for its nutritive value.

Be it remembered that most microscopic forms—bacteria and plankton—have very short generations, and if unhindered, increase their numbers exponentially.

Consider this: Suppose that a particular type of organism is able to fission once in twenty-four hours. If we started with one individual on January 1, 1971, approximately how many will we have on January 1, 1972? Well, it will be approximately 2^{365}, which means 365 x log 2.0 = 365(.301) or very roughly 10^{100}. Since there are said to be only 10^{72} particles—protons, electrons, neutrons, et cetera—in the total universe, that exponential series is going to be starved long before the year is up.

It's that sort of simple mathematics of exponential expansions that makes ecology so tough; it doesn't crumble easily, and is incredibly self-repairing.

Birds are in trouble, because their generations are relatively long and their rate of reproduction so much lower. A mutant gene for DDT resistance can't spread with the enormous rapidity it can in bacteria and short-generation-high-fecundity organisms like flies and mosquitoes.

The Ceylonese aren't going to be willing to accept two and a half million deaths, and many millions more rendered chronically ill by malaria for the sake of birds and plankton; if you think they're going to, you're out of your mind. May be tough on the birds—but they damn well intend to stay alive and healthy. And as of now, there is no adequate substitute for DDT that they can afford; DDT's long persistence in action is essential to their life and health.

But let's go to the other extreme—from microscopic high-turnover organisms to giant, very-long-generation organisms. Consider the ecology of elephants, instead.

In Africa, there's a different problem. The population of the African tribes has been increasing, as various health measures—including DDT!—

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have reduced the infant mortality rate. The people need more land to feed their increased population, and they're now bringing ancient pasturage into cultivation.

To do this, they have to dispossess the herds of elephants that have fed there. That's fairly easy—all they have to do is start a grass fire, and the elephants instinctively flee the flames.

In this way, thousands of elephants have been driven toward the great game refuges where the governments protect them from hunters— and from land-hungry farmers.

But because conservationists don't *think* adequately—though they emote real good!—the result has been a terrible and enduring disaster.

Obviously, what they should have done was to assign hunters to slaughter many hundreds of the elephants—but emotional sentimentality got in the way.

The result has been that the huge numbers of elephants have browsed all the edible plants to near total destruction. There wasn't enough browse to feed the huge herds of elephants, and out of hunger the elephants have torn down and killed the trees that would have been their self-renewing food supply. They've converted much of their refuge into a foodless desert, so badly devastated that it may take more than an elephant generation to recover—even if all elephants were removed so that growth could repair the devastation.

When a starving elephant attacks a tree to get the last edible branches at the top, he does it by uprooting and tearing out the tree. Elephants don't climb well, but they're good at knocking trees down where they can reach them.

Moreover, when an elephant finishes gleaning, there's nothing left for anything to eat—except termites, perhaps. But giraffes, deer, gnus and all the crossword puzzle animals also starve. Which means that after a brief feast on starving herbivores, the carnivores and scavengers starve, too.

Now this presented the wildlife refuge administrators with a clear-cut problem. Either cut down the elephant herds by slaughter until the land could feed the remaining herds, or take the pasturage away from the tribesmen so the elephants could eat, and the tribesmen could starve instead.

It's typical of the failure of emotionally involved—rather than thoughtfully and judiciously involved—ecologists that they did nothing.

As of my latest information, the elephants were starving and ruining the remaining land beyond recovery.

All in the name of humanitarianism and conservation and preserving endangered species and stopping the cruel practice of slaughtering helpless animals.

There are times when ecological faddism makes me acutely ill.

The Editor. ■

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the lost city of Ledtintell

On the second planet of a dim red dwarf sun believed to be over 22 billion years old—one of the oldest stars known—lies the immense ruin of Ledtintell. Built fifteen billion years before Earth's sun was formed, it now lies on an empty, airless world from which all gases have seeped away during the immense span of Time.

And the magnificent ruin itself has slumped into decay due to the sheer enormous pressure of time, the strong hard metals simply flowing an atom at a time as megayear followed megayear.

No other trace of the builders remains; they may have died, or simply spread to friendlier planets as younger stars formed in the Galaxy.

"Mysteries of the Galaxy," Ivan Chu McGinty,
Exploration House Publishers, Clovis II, 3931.

Or to be more factual, if less interesting—needles of crystal growth of lead-tin telluride, a remarkable semiconductor material that makes possible infrared sensing so sensitive and of such fast response that a TV camera operating on the infrared radiation of objects near room temperature is possible.

The incredible photograph, however, is thanks to the Cambridge Scanning Electron Microscope, and was taken by the Plessy Co. Ltd. at their Allen Clark Research Institute in England on a Cambridge Stereoscan, and was provided by Cambridge Scientific Instruments Limited.

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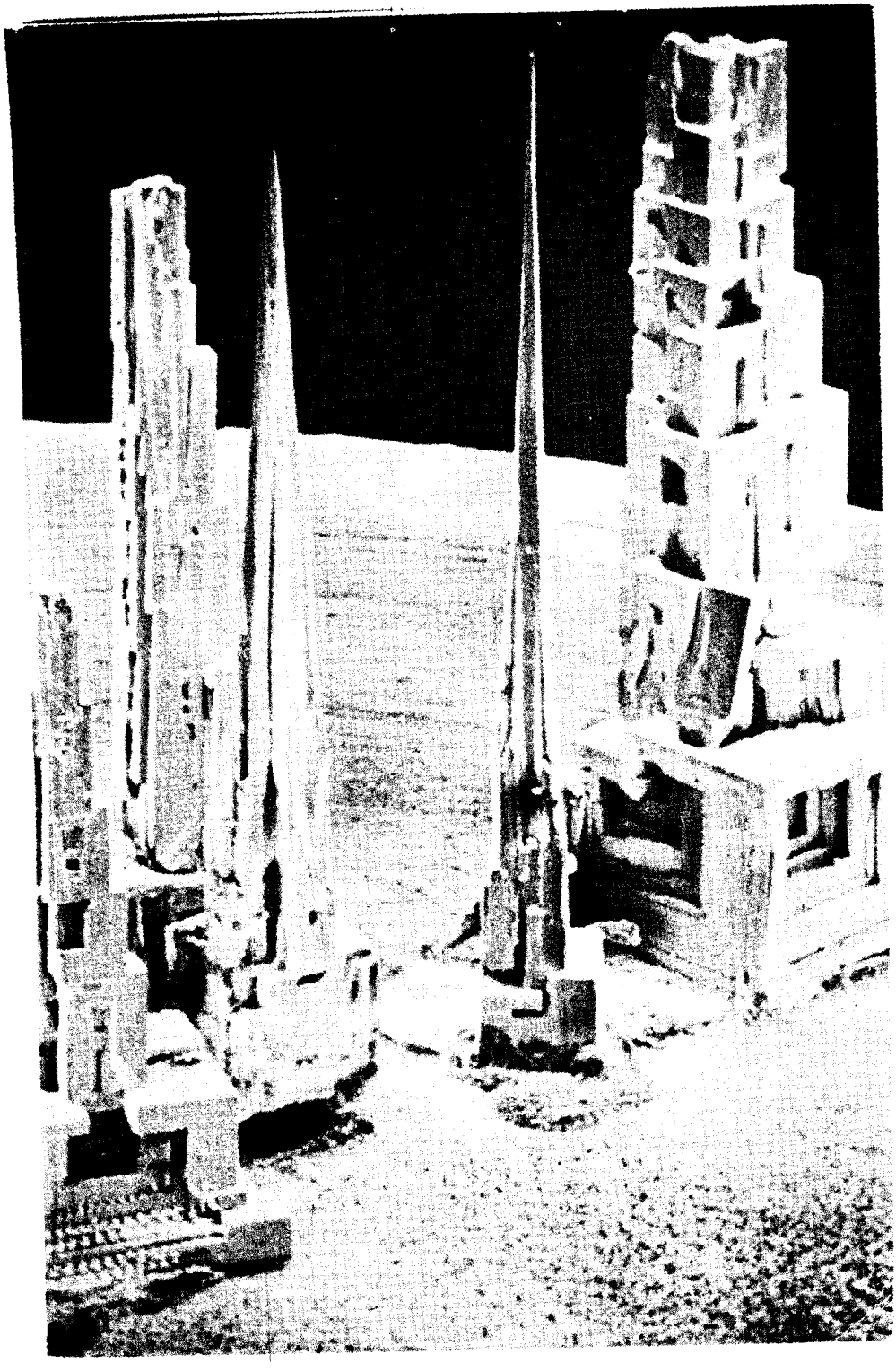

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